Health Plan Report Cards and Managed Care Enrollment

by

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In memory of Thomas J. Scanlon (1938-1989)

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Chapter I
Dissertation Overview

The health insurance market has undergone dramatic changes in the past decade as the market share of traditional indemnity fee-for-service (FFS) insurance plans has been eroded by health maintenance organizations (HMOs) and other types of managed care (MC) plans. Virtually non-existent in most markets three decades ago, by 1996 managed care plans covered 74% of the non-Medicare population with employer sponsored health benefit plans [GAO/HEHS-97-71]. Medicare managed care enrollment has experienced similar growth, although at a slower pace than the non-Medicare population, with 10% of Medicare beneficiaries enrolled in risk-contract HMOs in 1996 compared to 3% in 1987 [GAO/HEHS-97-50]. There are many reasons for these dramatic reversals including changes in the structure of employment and retirement benefit packages which encourage MC enrollment, changes in the acceptance of MC by consumers, and increased availability of HMOs and other types of MC insurance products.

Among other things, this revolution has resulted in heightened importance to employees and retirees of their health plan choice. This is largely due to inherent differences between FFS and MC insurance. Enrollees in FFS plans are generally free to seek care from the physician or hospital of their choice. However, if enrolled in a managed care plan, enrollees face reductions in coverage if they seek care from a hospital or physician outside of a panel of providers determined by the insurance plan. In addition, MC plans generally have tighter restrictions on access to care, which leads to concerns about differences in the quality of care across plans. Therefore, unlike in a FFS system, managed care enrollees must be concerned about the quality of care at the time of enrollment because that is when they commit to the various restrictions on care delivery.

The ability of the market to insure that quality of care and access do not fall below appropriate levels in a managed care dominated environment depends upon the extent to which purchasers of care are informed regarding important plan attributes. Recognition of the importance of information in today's health insurance marketplace has led to the development of standardized data collection systems, the most prominent of which is the

Health Plan Employer Data and Information Set (HEDIS). HEDIS was developed by a coalition of large employers and HMOs and was designed as a data reporting system for quality improvement and plan comparisons [NCQA, (1993)]. As Table 1-1 illustrates, HEDIS provides the backbone of many health plan report cards available to consumers, including the one used in this dissertation.

It is important to evaluate the impact of health plan report cards since virtually nothing is known about how health plan performance measures are used by consumers, or how these measures relate to plan enrollment. Not only is collection and dissemination of plan performance information costly, but the effect of this information on choice may not match the expectations of employers, the Health Care Financing Administration (HCFA) and other disseminating organizations.

This dissertation seeks to address this gap in the literature by analyzing the health plan choices of employees and retirees (both Medicare eligible and non-Medicare eligible) of a Fortune 100 company who were faced with a menu of health plan options. As part of the 1995 open enrollment process (which was conducted in the fall of 1994), HEDIS based, standardized, comparative health plan report card ratings were provided to employees and retirees by the firm. This dissertation analyzes the correlation between consumer health plan choices and these standardized health plan performance ratings while controlling for out-of-pocket plan price, availability of physicians, and characteristics describing the plan's model type [Independent Practice Association (IPA), Staff Model HMO, etc.]

1.1 Hypotheses

The first hypothesis to be tested is that the probability of health plan enrollment (for employees and retirees) is inversely related to the out-of-pocket price of the plan, all else constant. This hypothesis is consistent with economic theory and prior literature that has examined health plan choice.[1] It is also hypothesized that consumers are more likely to enroll in health plans with larger ratios of physicians to plan enrollees, all else constant, since plans with more physicians are likely to offer greater convenience and

[1] A detailed review of the literature is presented in Chapter 3.

flexibility of provider choice. Moreover, it is hypothesized that consumers are more likely to enroll in health plans which exhibit a "loose" relationship between the insurance component of the managed care plan and the physicians with whom the health plan contracts. The literature typically assumes that IPA physicians have greater autonomy than physicians in more tightly managed health plans since they treat patients from many different insurers (other MC plans as well as patients with traditional indemnity insurance) and derive only a portion of their income from any given HMO. Conversely, staff model physicians are thought to have less autonomy since they only treat patients with coverage from a specific HMO and are usually salaried employees who derive their entire income from the HMO [GAO/HEHS-97-71].

The remaining hypotheses pertain to the relationship of the firm constructed health plan report card measures and the probability of health plan choice. These measures were constructed with the purpose of identifying superior plans in five performance categories (physician quality, medical treatment, surgical care, employee satisfaction, and preventive care). It is hypothesized that the probability of plan enrollment is positively related to each of these measures, all else constant.

An observed positive relationship between enrollment and the report card ratings may exist for the following reasons: employees and retirees responded to the plan ratings provided by the firm; the plan ratings provided by the firm simply confirmed what employees and retirees already knew; the plan ratings provided by the firm were not consulted by employees and retirees, but were positively correlated with other plan traits that were valued by consumers, but unobserved by the researcher. An inverse relationship between the plan performance measures and plan enrollment would indicate that, on average, consumers did not respond to the report card information as predicted, since it was hypothesized that enrollment should be positively correlated with these measures.

1.2 Significance of the Study for Employers Offering Subsidized Health Insurance

Over two thirds of employees under the age of sixty-five receive their health insurance from employer-based health benefit programs, and the cost of providing these benefits has risen from about two percent of total employee compensation in 1970 to

more than five percent in 1996 [GAO/HEHS-97-71]. Employers have responded to cost escalation by either dropping coverage altogether [Fronstin, (1997)] or by changing the manner in which employer sponsored health benefits are provided [Cooper and Schone (1997), GAO/HEHS-97-71].

A 1996 survey of the health benefit strategies of 25 large purchasers, conducted by the United States General Accounting Office (GAO) [GAO/HEHS-97-71], indicated that large employers who continued to offer coverage responded to increasing costs by; contracting with managed care plans; placing greater emphasis on the measurement of cost and quality; requiring additional cost sharing from employees while providing more information on managed care options; relying on purchasing power and competitive market principles when contracting for health benefits. A cornerstone of many of these purchasing strategies is that well informed, cost-conscious consumers will drive down overall program costs. Paradoxically, half of the firms in the GAO's sample indicated that they currently provide employees with a health plan report card, despite evidence that 58 percent of consumers reported being wary of employers as a source of information about health plan performance [Hibbard et al., (1997)].

Employer strategy changes may have been successful since managed care enrollment for employer groups has increased from 27% in 1987 to 74% in 1996, and increases in health plan premiums have been much lower (and have even decreased for some purchasers) in the 1990s relative to the previous decade. However, as the General Accounting Office clarifies in its report, it is difficult to discern the relative influence of changes in purchasing strategies related to financial incentives versus other non-financial factors (i.e. the provision of report card information) on reductions in premiums and increases in managed care enrollment.

In addition to active employees, many employers also subsidize health insurance for early retirees and for Medicare eligible retirees in the form of premium subsidies for enrollment in Medigap FFS plans or Medicare HMOs. Increased costs of operating these programs, along with recent changes in accounting rules regarding disclosure of future liabilities for retiree health benefits, have prompted a decline in both the number of firms offering retiree health benefits and in the number of retirees participating in employment based coverage. Firms that continue to offer retiree health benefits have tried to utilize

similar cost saving strategies for retiree populations that were used for active employees, but again it is difficult to disentangle the relative importance of changes in financial incentives with changes in non-financial incentives [GAO/HEHS-97-150].

This dissertation will provide insight on the relative importance of various purchasing strategies by separately controlling for and examining the relationship of out-of-pocket plan price, report card measures, accessibility, and provider choice on managed care enrollment in a population of active employees and retirees.

1.3 Significance of the Study for the Medicare Program

Like many large employers, Medicare, the nation's federal insurance program for the elderly and disabled, is also facing immediate financial difficulties. Many analysts believe that Medicare's problems are more serious than those facing employers because of Medicare's history of entitlements, the projected insolvency of the Hospital Insurance (Part A) trust fund in 2002, and the changing demographics of the population [Moon and Davis, (1995)].

Numerous policies have been proposed to address Medicare's financial crises including raising taxes, reducing benefits, and requiring wealthy beneficiaries to pay higher premiums and deductibles. The proposals that have received the most serious attention however involve permutations of competitive models that have experienced success in the private sector. For example, several analysts [Aaron and Reischauer (1995), Butler and Moffit (1995)] have suggested converting Medicare to a defined contribution program, similar to the federal employees health benefits program (FEHBP). In the FEHBP, beneficiaries receive a fixed dollar contribution (or voucher) and independently shop for the best plan value. Proponents of these proposals argue that a defined contribution would limit Medicare's financial exposure and would encourage competition in the insurance market since premiums in excess of the defined contribution would be the responsibility of the Medicare beneficiary. An integral component of these proposals is the expansion of the role of consumer information such as health plan report cards. Proponents argue that providing beneficiaries with information about choices will facilitate competition, drive down prices in the insurance market, make government expenditures more predictable, and significantly reduce overall costs. A recent study by

Lawrence Baker (1997) supports this conclusion, predicting that a ten percentage-point increase in the Medicare HMO market share would yield a 1-3 percent decrease in aggregate Medicare spending.

Another popular Medicare proposal would maintain the existing Medicare risk contract system but would expand the number of beneficiaries that choose this option. Some analysts argue that an aggressive information campaign designed to inform consumers of the benefits of Medicare HMOs (often low or zero premiums, no deductibles, and low co-payments as well as additional benefits such as coverage for outpatient prescription drugs, dental care, and vision) would lead to increased voluntary enrollment in Medicare risk-contracts. There is little empirical evidence to support these claims and the Medicare eligible retiree sample to be studied in this dissertation provides an excellent opportunity for analysis since the retirees received health plan report card information from the firm. Moreover, GAO survey results have indicated that many Medicare beneficiaries currently enrolled in Medicare HMOs were enrolled through employer groups, making the sample of retirees that will be analyzed a policy-relevant group to study.[2]

A key theme of many Medicare proposals is that increased choice and information will lead to greater competition in the insurance market which will in turn lead to savings for Medicare, or at the very least more predictable expenditures. However, there is very little empirical evidence about how retirees would behave under such as system.

Approximately 74 percent of Medicare beneficiaries live in areas served by at least one Medicare managed care plan, and 56 percent have two or more plans available to them. In some areas such as Los Angeles there are as many as 15 Medicare HMOs available to beneficiaries [Zarabozo, Taylor, and Hicks (1996)]. Yet despite the availability of managed care options, HMO enrollment continues to be much lower for the Medicare population than the under 65 population. Whether information and price incentives can have the same effect in the Medicare population as in the private sector

[2] GAO/HEHS-97-50 reports that in January 1996, about 21 percent of all beneficiaries in Medicare risk HMOs were enrolled through employer groups. In addition the number of beneficiaries in HMOs sponsored by employer groups increased by 17.5 percent between 1995 and 1996.

remains to be seen. The analysis contained in this dissertation will facilitate comparisons between the Medicare and non-Medicare populations in terms of the relationship of price and report card ratings to the probability of plan enrollment.

1.4 Significance of the Study for Health Insurance Plans

Health plans incur significant costs to comply with industry standards and to demonstrate plan quality and value to purchasers. The most frequently used vehicles for communicating quality and value are accreditation by the National Committee for Quality Assurance (NCQA) and the reporting of HEDIS data. NCQA accreditation is a voluntary process, but one that is increasingly viewed by health plans as a necessity in the competitive market since some purchasers have refused to contract with health plans that have not obtained or sought NCQA accreditation [GAO/HEHS-97-71]. The cost of NCQA accreditation varies depending on the size of the managed care organization, but the typical range, according to one NCQA official, is between $35,000 and $50,000.[3] Plans that receive provisional accreditation or one year accreditation must undergo a re-survey which can cost between $20,000 and $25,000.[4]

The costs of collecting and reporting HEDIS data are separate from and usually far exceed the costs of accreditation. HEDIS costs vary by the size of the managed care organization, the information system(s) used by the organization, as well as how these costs are internally accounted for. To get an estimate of the costs of collecting and reporting HEDIS data, two health plans operating in an eastern state were contacted. One plan with an enrollment of 180,000 members estimated the costs to be about $300,000 per year. The other company, which operates many plans with total MC enrollment of about twelve million members, estimated the costs to be about $1.20 per member per year. These estimates suggest that the collection and reporting of HEDIS data is a

[3] NCQA accreditation involves on site and off site evaluations that focus on the following categories: quality improvement, physician credentials, member rights and responsibilities, preventive health services, utilization management, and medical records. Although plans can meet the quality improvement requirements without collecting and reporting HEDIS data, many health plans view HEDIS as a necessity since it has become the industry gold standard and since it is governed by the NCQA.

[4] The cost of NCQA accreditation depends on the size of the managed care organization since accreditation is a labor intensive process. The typical accreditation involves a minimum of four individuals including two physicians and two administrative surveyors. Some larger managed care organizations have required survey teams with as many as sixteen individuals. Re-surveys typically involve one physician and one administrator.

significant expense, while the benefits that are derived from these efforts are questionable at best.

Aside from issues of costs, some health plans have refused to report HEDIS data because they feel that HEDIS is not a valid and reliable instrument for measuring health plan quality. For example, United Health Care, which operates 40 plans with 14 million enrollees, refused to participate in Newsweek Magazine's 1996 health plan evaluation. "Everyone in the industry is finding problems with these quality measures. They're not appropriate for comparing plans," stated Lee Newcomer, medical director for United Health Care [Spragins, (1996)]. The fact that only about half of the health plans in the country participated in the NCQA's recent request for HEDIS 3.0 data for its "Quality Compass" product is another example of how plans feel about HEDIS. According to NCQA officials, this response rate was not very different from the HEDIS 2.5 version of Quality Compass and was much lower than expected.

For plans that choose not to report HEDIS data, the decision is often based on the perceived cost-benefit of HEDIS data collection and reporting. However, if purchasers value this information, which is the backbone of many health plan report cards, plans that refuse to collect and report the data could lose market share if employers and consumers will not contract with or enroll in these health plans. The analysis in this dissertation will provide insight on the importance of report card information to individual consumers by examining the correlation between consumer choices and HEDIS based report cards provided by the firm.

1.5 Outline

The dissertation will proceed as follows. Chapter II discusses the economic theory pertaining to the purchase of health insurance and the choice of managed care plan. Chapter III reviews the literature on health plan choice. Chapter IV describes the data to be analyzed. Chapter V outlines the econometric methods that will be used in the data analysis while Chapter VI presents the empirical results from estimation. Chapter VII concludes the dissertation with a discussion of the findings, the limitations of the study, and an agenda for future research.

Table 1-1: Health Plan Report Cards

Source of Report Card	Date Published	Data Source	Health Plans Sampled
Consumer Reports Magazine	August 1996	Survey of Magazine Readers HEDIS Data Collected in 1994	HMOs and PPOs Identified from Sample of 30,000 Readers
Newsweek Magazine	June 1996	1996 Newsweek/Foundation for Accountability Survey State Insurance Departments Center for the Study of Services Fortune 500 Companies HEDIS	75 Large HMOs
US News & World Report Magazine	September 1996	HEDIS 2.5 Data from NCQA Quality Compass	174 HMOs in 42 States and Washington, D.C.
NCQA Quality Compass	September 1996	Plan Reported HEDIS 2.5 Data	250 Plans that Voluntarily Submitted HEDIS Data
GTE Corporation	1996	Plan Reported HEDIS 2.5 Data 1994 Employee Health Care Value Survey	140 Plans that GTE Contracts with for Employee and Retiree Health Benefits
Consumer's Checkbook	1996	1995 Survey of Enrollees in Plans of the FEHBP	Plans Participating in Federal Employees Health Benefits Program (FEHBP) with 300 or More Enrollees
CA Cooperative HEDIS Reporting Initiative	1996	HEDIS 2.5 Data Collected and Validated by Third Party	25 California HMOs

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Chapter II

Economic Theory of Health Plan Choice

2.1 Health Plan Utility

Similar to the utility of any other good or service, the utility of a health plan can be modeled as a function of its attributes. Traditionally, when FFS health insurance dominated the marketplace, health plans primarily differed on financial attributes such as price, deductibles, coinsurance and stop-loss. Since choice of physician and hospital were generally not restricted in FFS plans, utility was less affected by non-financial attributes. Today however, with the emergence of various managed care products that restrict provider choice and control access, non-price dimensions such as convenience, quality, and the availability of providers are much more important when choosing a health plan. For purposes of this chapter, health plans will be discussed according to financial and non-price attributes. Chapter 3 reviews the empirical literature on consumer health plan choice and its limitations given the widespread growth of managed care.

2.2 First Principles and The Demand for Medical Care and Health Insurance

The demand for health insurance is a derived demand that results from the consumer's underlying utility for health. Equation (2-1) illustrates that consumers obtain utility from two things; health (H) and all other goods (X). The 'all other goods' component can include consumption goods as well as leisure.

(2-1) $U = U(H, X)$

Consumers get disutility from poor health both directly and indirectly since poor health itself causes disutility and since poor health may limit one's income and ability to purchase or enjoy consumption goods (due to disability for example). Health status is partly a random process and partly a process that can be influenced by individual behavior and the consumption of medical care. For example, some health outcomes (i.e. prostate cancer) appear to be unaffected by behavior while others (i.e. lung cancer) are linked to the behavior of the individual (i.e. smoking). Moreover, it is sometimes possible for individuals to protect or improve their health status by consuming medical

care. The relationship between medical care and health status varies for different types of medical care, but is generally assumed to be a concave function, improving with the consumption of medical care at a diminishing rate, until the point where additional medical care may actually be harmful [Phelps, (1992)].

Therefore, the demand for health insurance, insofar as it exists, is derived from the demand for medical care which is derived from one's underlying demand for health as illustrated by the utility function in equation (2-1).

Risk Averse Consumers and The Purchase of Insurance

Consumers purchase health insurance to pay for medical care in the event that it is needed instead of just paying out-of-pocket for medical care when it is needed, because medical care can be expensive and risk averse consumers would rather smooth their consumption over time [Fisher (1930), Friedman (1957)]. By purchasing insurance, consumers face smaller certain losses in each period (i.e. in the form of out-of-pocket premiums) rather than the possibility of large losses in any given period should illness strike and medical care be needed. Hence, the demand for health insurance is not very different from the reason why homeowners insurance is demanded.

Standard economic theory has traditionally modeled the insurance purchasing decision as a decision between taking a gamble (remaining uninsured) v. choosing to avoid such a gamble (purchasing insurance). The literature has concluded that risk averse individuals refuse fair bets (remaining uninsured and being personally liable for possible losses) and opt instead for the certain loss associated with the premiums required to pay for health insurance coverage. Risk aversion implies that the disutility associated with a loss is greater than the utility associated with an equivalent gain due to the assumption of diminishing marginal utility.

Although risk aversion explains why consumers purchase health insurance rather than remain uninsured, the concept of risk aversion is less helpful for determining which plan, from a menu of plan options, will be chosen when insurance plans differ on non-price attributes.

2.3 Consumer Choice in Economics

Microeconomic theory assumes that rational consumers seek to maximize utility subject to a budget constraint. Typically this involves a consumer deciding how best to allocate a fixed amount of income among two or more potential goods, each with its own relevant price. When the consumer is choosing consumption bundles of two or more goods, A, B, ...Z, utility maximization occurs when the ratio of the marginal utilities of each of the goods to their own price is exactly equal for all goods as illustrated by equation (2-2).

(2-2) $MU_a/P_a = MU_b/P_b = \ldots\ldots = MU_z/P_z$

Equation (2-2) states that a consumer maximizes utility when the extra satisfaction received from an additional dollar spent on a particular good is exactly equal to the marginal utility of an extra dollar spent on any other good. The optimal solution determines the particular quantities of each good that a rational utility maximizing consumer will purchase.

A more appropriate model for studying choice of health plan recognizes that consumers are not choosing optimal quantities of various insurance plans or their attributes, but instead are choosing one plan from a specified set of options as is usually the case with employment sponsored health benefit plans. This model recognizes that the set of available health plan options is fixed but that these options may vary from one another on a variety of possible dimensions (financial and non-price plan attributes). It is assumed that the consumer chooses the option with the set of attributes that provides the greatest total utility. Thus, it is the attributes of the health plans themselves that provide direct utility to the consumer. However, the attributes are generally not priced separately and consumers usually do not have the option of going through a "cafeteria" style line and choosing the exact level of each attribute that is preferred.

Figure 2-1 illustrates a simple case in two dimensions of a consumer choosing the optimal levels of two plan attributes (i.e. quality and convenience) given a certain amount of spending, prices, and preferences for these attributes as measured by the budget constraint and the shape of the indifference curves. The dash marks along the ray (OR) extending from the origin represent possible levels of spending on the two attributes. The

top panel of Figure 2-1 illustrates, for example, that the ideal level of both attributes given the level of spending (budget constraint A) occurs at Q^* and C^* respectively. However, in the health plan purchasing decision, the exact level of these attributes may not be obtainable in the set of options that comprise the consumer's fixed choice set. Since the consumer is not able to obtain the exact level of each attribute desired, the consumer will choose the plan from the fixed choice set that is closest to the utility maximizing combination of both attributes. For example, the bottom panel of Figure 2-1 assumes the same amount of expenditure (budget constraint A) and the optimal plan represents the preferred levels of convenience and quality (C^* and Q^*) from the top panel. Since the optimal plan is not available, the consumer may pick any other option (i.e. plan A, B, C, or D).

Consumer Choice In The Presence of Uncertainty:

Because one's future health status and medical care requirements are usually not known with certainty, economic theory generally models the consumer as maximizing expected utility. Expected utility theory recognizes that there are various possible 'states of the world' and that the utility associated with certain products (or their attributes) depends on which states of the world are realized. Expected utility theory is conducted by defining subjective probabilities over the likelihood that any given state of the world will occur. Expected utility theory is appropriate for the choice of health plan since consumers must forecast future health care needs in order to weigh the uncertain value of health plan attributes against the certain loss of premiums.

Adverse Selection

The utility of a health plan may also be a function of individual characteristics (such as age, gender, and health status) as well as plan specific characteristics. However, individual characteristics enter the utility function because they may influence the manner in which plan characteristics are valued. For example, gender may influence the utility of a health plan, not because gender enters the utility function directly, but because gender may influence the extent that certain plan characteristics, such as flexibility of provider

choice, are valued. Continuing with the example, women may prefer HMOs differently than men, not because of gender per se, but because the ability to retain one's obstetrician/gynecologist is differentially valued by women relative to men. Similarly, sicker people may prefer FFS plans (relative to healthier persons), which typically offer unrestrained provider choice.

The idea that health plan utility may be influenced by personal characteristics is referred to as adverse selection (or selection bias) in the health economics literature, and is a result of asymmetric information between the insured and the insurer. Hellinger (1995) has recently reviewed the empirical literature on selection bias. In empirical studies, selection bias should be modeled by interacting personal characteristics with health plan characteristics. Specified in this manner the coefficients on the interaction terms provide useful information such as how older or younger people differ in their sensitivity to out-of-pocket premiums or how the ability to choose one's provider is valued differentially by gender. Entered directly into empirical models, the coefficients on these variables simply provide descriptive information as to who enrolls in which types of plans, but the structural reason as to why these individuals are attracted to certain plans remains unknown.

2.4 Employment and Health Insurance

A study of health plan choice would be incomplete without a discussion of the implications of employer sponsored health plan coverage since almost two-thirds of privately insured Americans receive health insurance through employer sponsored health benefit plans [GAO/HEHS-97-35]. The prevalence of employer sponsored insurance coverage complicates the theory presented above and potentially biases the estimates obtained from empirical models. This section briefly discusses the role of employer provided health plan coverage and the impact that it has on health plan choice.

As Goldstein and Pauly (1976) first suggested, the fact that many employees receive their health insurance benefits through employer sponsored plans is problematic for structural models of health plan choice because it serves to limit the set of plans available to employees. Given this limitation it is difficult to know whether empirically

observed choices represent one's true underlying preferences for health plans, or one's preferences for plans conditional on the restricted choice set. Stated differently, health plan choice is not necessarily exogenous from the worker's choice of employer or from the employer's choice of plans to offer.

Goldstein and Pauly address this issue by modeling group health insurance as a local public good. They describe different methods by which an employer might determine the choice set to be offered. For example, employers may offer a plan or set of plans that are consistent with the median preferences of workers, or plans that are consistent with some other goal such as minimizing the total cost of providing health insurance. The method chosen can potentially impact estimates obtained from empirical models that attempt to estimate an employee's underlying preferences for health plan attributes if the employee's most preferred plan is not included in the choice set.

Unfortunately, due to a shortage of appropriate data, there are very few studies that have examined the magnitude of this bias or whether employees choose employers on the basis of the health benefits that are offered. Instead, choice of health plan and choice of employer has generally been modeled as exogenous. Some exceptions include work that has examined the effect of health insurance on labor supply and worker mobility [Buchmueller and Valletta [(1997), (1995)], Cooper and Monheit (1994), Cotton (1991), Gruber and Madrian (1994), Madrian (1994), Monheit and Cooper (1994)], and studies that have looked at health plan offerings by employer type [Frontsin (1997), Cooper and Schone (1997)].

2.5 Alternative Models of Consumer Choice:

The decision rule for expected utility theory can become quite complex, and even intractable, as more attributes are relevant to the decision making process. This has prompted some scholars to argue, based on empirical observation, that consumers may not actually make decisions that are consistent with expected utility theory. Alternative models of decision making were stimulated by Herbert Simon's (1959) theory of Bounded Rationality. Simon argued that consumers do not always optimize when making decisions but instead 'satisfice', meaning that consumers are rational in their

decision making process but often stop short of seeking the optimal solution due to time constraints, opportunity costs, etc. Simon's theory of rational, sub-optimal decision making led many scholars to examine empirical evidence in search of models used by consumers in the decision making process. The models described in the economics, decision sciences and marketing literature explain how individuals process information, make judgments, and ultimately make decisions.

The most widely received "alternative" to expected utility theory is "prospect theory" (PT) which was developed by Daniel Kahneman and Amos Tversky (1979). PT has been applied to models of health plan choice by Marquis and Holmer (1986) and Ellis (1989). The impetus behind the development of prospect theory was empirical observations that consumers tend to violate three of the main tenets of expected utility theory. First, expected utility assumes that the domain of the utility function is final states of wealth. However, empirical observations indicate that consumers sometimes make choices based on the value of deviations from current states rather than the value of final wealth positions. Second, expected utility theory assumes that one's expected utility is an additively separable function of the probabilities of the possible outcomes multiplied by the utility of these outcomes. However, empirical observations indicate that individuals tend to weight outcomes by their probabilities with the weights not necessarily summing to one. Instead, outcomes (or attributes) that are considered certain relative to outcomes (or attributes) that are merely probable are overweighed suggesting that the true valuation algorithm is different from expected utility theory. It is usually assumed that individuals are risk averse implying a concave utility function exhibiting the property of diminishing marginal utility. However, empirical observations indicate that people may be risk averse in some domains (diminishing marginal utility) and risk seeking in others (increasing marginal utility). This leads to a "value function" that looks different from the standard utility function as illustrated in Figure 2-2.

Prospect theory assumes that the decision making process is comprised of two phases. The editing phase consists of a preliminary analysis of the offered prospects (choices) and a comparison of the attributes of the offered prospects with a reference point (i.e. with one's current health plan). The editing phase leads to a more simple

representation of these prospects. The valuation phase assigns value to the remaining choices according to a "value function" which differs from expected utility in two ways. First, the value of prospects are not specifically weighted by the probabilities of the outcomes. Instead, certain outcomes (attributes) receive more weight than uncertain outcomes and the weights for each outcome are not required to sum to one. Second, outcomes are not valued in terms of their final levels as in expected utility theory, but are evaluated as either gains or losses relative to a reference point. In practice this means that risk aversion is not assumed in all domains. Instead, PT allows consumers to be risk averse in the domain of gains and risk seeking in the domain of losses, consistent with empirical observations according to Kahneman and Tversky.

The differences between PT and utility theory seem theoretically plausible. However, the practical test of the usefulness of PT depends on whether or not it changes the manner in which health plan choice is modeled and the estimates that are obtained from these models. PT has been applied to models of health plan choice by Marquis and Holmer (1986) and Ellis (1989) with both studies reporting significant differences between models that account for PT and those that do not.

The fundamental manner in which empirical models of PT differ from empirical models of expected utility theory is the nature in which the utility function is specified. For example, Marquis and Holmer estimate models of health plan choice in which the expected utility of plan j for family i, is modeled as a function of family i's, non-medical care expenditure (n_{ij}), which is equal to the family's disposable income (y) minus the plan premium (h_j) minus out-of-pocket medical expenditures associated with plan j (e_{ij}), as illustrated in equation (2-3). In models that incorporate PT, equation (2-3) is replaced by an "expected value" equation similar to that presented in equation (2-4). Equation (2-4) equates the expected value of plan j to person i, who currently is enrolled in plan k, as the certain difference in the out-of-pocket premiums of the two plans (h_k-h_j) plus the expected value of the difference in the out of pocket expenditures associated with the two plans (e_{ik}-e_{ij}).[1]

[1] For simplicity, this example assumes choice between two FFS plans that vary on premiums and out-of-pocket expenditures only.

(2-3) $Eu_{ij} = \Sigma_i p_i U(n_{ij})$ where $n_{ij} = y - h_j - e_{ij}$

(2-4) $Ev_{jik} = V(h_k - h_j) + \Sigma_i p_i V(e_{ik} - e_{ij})$

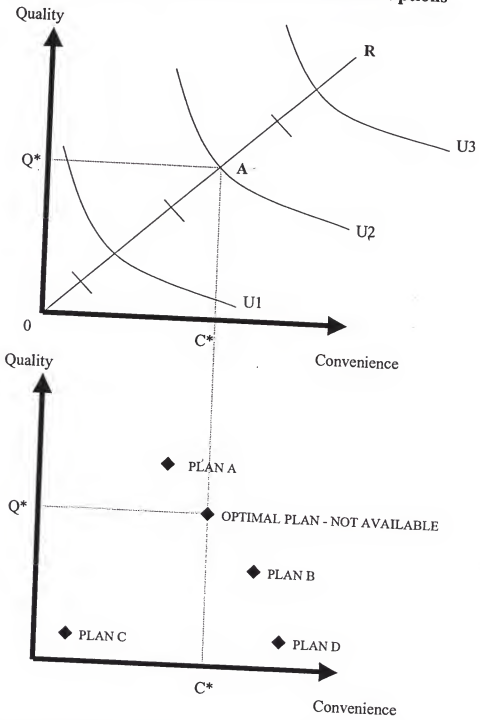
Two things should be noted from equation (2-4). First, and consistent with prospect theory, the value function is defined as gains (or losses) in non-medical care consumption relative to a reference health plan, rather than final levels of non-medical consumption as is the case in equation (2-3). Essentially the gain (or loss) in non-medical consumption associated with plan j when plan k is the reference plan is equal to the expression in equation (2-5). Second, and most important for estimation, is that unlike the utility function, the value function is not assumed to be globally concave but instead is assumed to have an alternative form. For example, the value function used in the empirical work by Marquis and Holmer (1986) is illustrated in Figure 2-3. Note that the value function takes on a different functional form depending on the value of g_{ijk} as illustrated in the graph and at the bottom of Figure 2-3. Marquis and Holmer chose this specification so that it implied risk aversion for positive gains ($g_{ijk} > 0$), risk seeking for small losses ($g^* < g_{ijk} < 0$), and risk aversion for large losses ($g_{ijk} \leq g^*$).

(2-5) $g_{ijk} = (n_{ik} - n_{ij}) = (h_k - h_j) + (e_{ik} - e_{ij})$

Estimation involves first estimating g_{ijk} for each alternative in the chooser's choice set, and then estimating the value associated with that alternative given parametric assumptions made about risk aversion relative to gains and losses. The results in equation (2-4) can then be used to estimate models of health plan choice. The real difference between expected utility theory and PT is the difference in the functional form between the utility function and the value function. However, discrete choice models of utility maximization can include variables that represent differences in the values of plan attributes from a reference plan. Specified in this manner, the utility of any plan is simply a function of how its attributes differ from those of the reference plan. Therefore differences in estimates between the two types of models depend on what is assumed about risk aversion. The appropriate model for estimation will depend on the research question to be answered and empirical evidence regarding consumers' preferences for risk. Since the primary research question in this dissertation focuses on the correlation of health plan choice with plan attributes at a point in time, rather than on plan switching

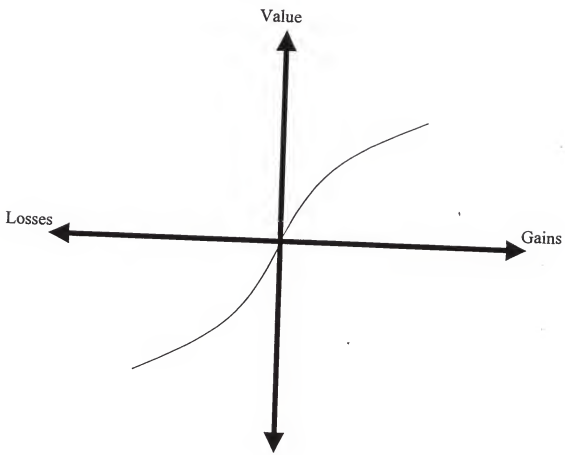
from one year to the next, empirical models based on expected utility are sufficient for the analysis.

Figure 2-1: Health Plan Choice from a Discrete Menu of Options



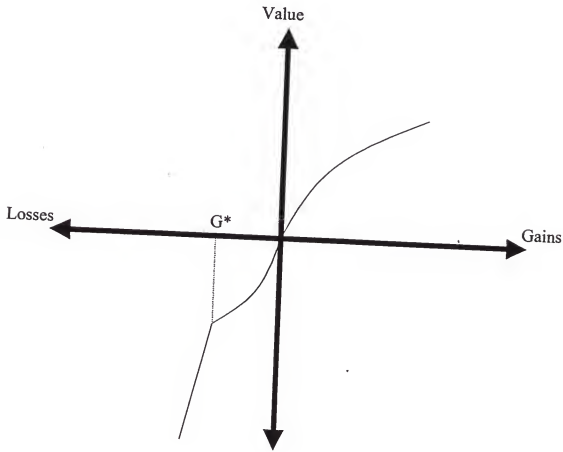
Graph in top panel taken from Nicholson, Microeconomic Theory, 3rd Edition, 1985

Figure 2-2: The Value Function



Graph taken from Kahnemann and Tversky, 1989

Figure 2-3: Marquis and Holmer's Value Function



$$V(g)= \begin{cases} 1-\exp[-a_1 g] \text{ if } g \geq 0 \\ -1(-\exp[a_2 g] \text{ if } g^* < g < 0 \\ -1(\ 1-\exp[a_2 g^*]+(1-\exp[-a_3(g-g^*)]) \text{ if } g \leq g^* \end{cases}$$

Where a= risk parameter

Graph taken from Marquis and Holmer, 1986, page 8

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Chapter III

Review of the Literature

CONSUMER HEALTH PLAN CHOICE: Current Knowledge and Future Directions

Dennis P. Scanlon, Michael Chernew, Judith R. Lave

Abstract

A keystone of the competitive strategy in health insurance markets is the assumption that "consumers" can make informed choices based on the costs and quality of competing health plans, and that selection effects are not large. However, little is known about how individuals use information other than price in the decision making process. This review summarizes the state of knowledge about how individuals make choices among health plans and outlines an agenda for future research.

We find that the existing literature on health plan choice is no longer sufficient given the widespread growth and acceptance of managed care, and the increased proportion of consumers' income now going toward the purchase of health plans. Instead, today's environment of health plan choice requires better understanding of how primary variables other than price influence plan choice, how secondary variables such as health status interact with primary variables in the decision making process, and how specific populations differ from one another in terms of the sensitivity of their health plan choices to these different types of variables.

3.1 Introduction

The health care system in the United States is undergoing a major transformation, driven in part by the growth of managed health care plans. Many policy analysts believe that promoting a competitive strategy is an effective mechanism to contain system costs and promote quality of care. While a considerable literature has developed on the necessary steps to make this strategy work (11-15), a keystone of that strategy is the assumption that "consumers" can make informed choices based on the costs and quality

of competing health plans.[1] Furthermore, many analysts believe that the competitive strategy will fail if selection effects are large. Selection bias occurs when individuals with particular characteristics (i.e. healthier people) enroll in certain health plans while individuals with other characteristics (i.e. sicker people) enroll in other health plans. In the extreme, selection problems can cause insurance markets to collapse (46, 62).

Two examples demonstrate the importance of understanding the factors that influence health plan choice. First, the 104th Congress considered policies to encourage Medicare beneficiaries to enroll in managed care plans or to open Medical Savings Accounts (54, 58, 59). However, the overall economic impact of these policies is difficult to predict without good empirical evidence about the beneficiaries' sensitivity to premium prices and other plan attributes. Second, the private sector has engaged in a strategy to accredit managed care plans, and to develop report cards on plan structure, process, and outcomes (56, 57). However, little is known about how individuals will use such information in making decisions (1a, 55).

This review summarizes the state of knowledge about how individuals make choices among health plans. We set forth a conceptual model of health plan choice and examine some decision-based models that provide the theoretical backbone for the estimates found in the empirical literature. We then review the evidence found in this literature on health plan choice. Finally, we examine the usefulness and appropriateness of the current literature for policy analysis and outline an agenda for future research.

This paper focuses on the choices that individuals make from the options available to them; it does not examine how the choice set arises. In particular, it does not look at how employers choose which plans to offer and the conditions under which they are offered. The literature on this topic is sparse, yet this is an extremely important issue since employer health plan offerings may influence or be determined by the type of workers who are attracted to particular employers (22), or the mobility of employees

[1] For the remainder of this paper, the term "health plan" is used broadly and includes all health insurance and health maintenance plans ranging from staff model Health Maintenance Organizations to indemnity health insurance plans.

between firms (24, 45).

Field & Shapiro (18) provide an historical account of the labor market and the decision of firms to provide health insurance. Finally, this review focuses primarily on employment-based and private sector health plan choice and choice of health plan in the Medicare system; it does not look at the literature on plan offerings and choices under the Medicaid program (19).

3.2 A Conceptual Model of Health Plan Choice

What Does One Buy when Choosing a Health Plan?

Historically, the health plan market was dominated by fee-for-service (FFS) indemnity plans. Typically, these plans varied in their level of financial protection: deductibles, co-payments, and out-of-pocket maximums. In some cases they also varied in the types of services covered and the limits on that coverage (i.e. mental health care). Generally, there were few or no restrictions on the providers (physicians, hospitals) covered under the plans. Thus, choice of health plan traditionally meant choosing the arrangement that best protected an individual from financial loss in the event that health care was needed. The option that was deemed best was largely a function of individual risk aversion and wealth.

This traditional view of health plan choice became outdated with the emergence of Health Maintenance Organizations (HMOs) and other managed care options that combine the financing and delivery of health care together in one package (2). The fundamental difference between managed care plans and traditional FFS indemnity plans is that the former places restrictions on the choice of provider and the process of care. Hence, health plan choice is no longer simply a matter of selecting a system for financing medical care, but instead now involves an a priori decision of choosing a set of providers and system for delivering care. Simply put, in a managed care environment, the quality of providers and characteristics of the delivery system are important at the time of health plan choice.

Decision-Based Models for Studying Health Plan Choice

Most empirical studies of consumer health plan choice adopt the neoclassical economic approach to modeling consumer choice under uncertainty (16, 41, 42).[2] This approach assumes that consumers act "rationally" when making insurance purchasing decisions, meaning that they are cognizant of the relevant features of the health plans under consideration, and that they carefully weigh the health risks they face and the potential costs of the medical care that they may consume. It is posited that consumers are risk averse and that they have a "utility function" that assigns a level of satisfaction to different possible standards of wealth (or health). Since the consumer does not know his or her future health care demand with certainty, he or she is said to choose the health plan that maximizes expected utility (16, 48). It has been a natural extension of these models to expand a consumer's utility function to include preferences for such features of health benefits packages as having choice among physicians.

Theory predicts that demand for a particular plan will generally be inversely related to plan price, copayment requirement, and deductible level. Demand will also be sensitive to consumer-specific variables such as income (48). Furthermore, it is a straightforward extension to show that the more consumers value features of an insurance package such as physician choice, the more an insurance package will have to offer in terms of lower premiums, deductibles, copayments, and so forth, to induce the consumer to purchase a plan that offers less physician choice.

The statistical models used to estimate the structural parameters of health plan choice are a direct extension of the theoretical neoclassical economics paradigm of utility maximization. Most state-of-the-art empirical work employs probit or logit analysis to model the probability that an individual will enroll in a particular health plan as a function of price and other plan attributes that are believed to be important in the decision making process. This class of models is appropriate for studying issues of health plan

[2] Some authors, such as Marquis & Holmer (37) and Ellis (10b), have argued that the neoclassical approach of expected utility maximization is too restrictive for studying health plan choice because of its reliance on global risk aversion. These authors suggest that an alternative approach—prospect theory—may be more appropriate since it allows consumers to be risk seeking in certain domains.

choice since the dependent variable is usually of a binary or discrete nature. In addition, these models can provide insight for policy analysis since the results can be used to examine crucial questions such as the likely change in the distribution of health plan enrollment given an exogenous change in plan attributes (e.g. price or quality).

The most appropriate methodologies for discrete choice analysis are the conditional choice or nested choice models. The main advantage of these models is that they allow for the estimation of the trade-off between price and other health plan attributes that are included in the model (such as convenience, quality, etc). In studies of hospital choice, Garnick et al (20) show that estimates from conditional choice models are more robust to permutations in sample than alternative statistical frameworks.

The conditional logit assumes the Independence of Irrelevant Alternatives (IIA), which implies that the relative probability of choosing a given health plan is independent of the other plans in the consumer's choice set. In practice, this means that if a new HMO were added to an employee's choice set as a potential option, the relative probabilities of choosing any of the other existing plans would not change owing to the addition of the HMO. Feldman et al (16) point out that it is unlikely that IIA holds since health plans are likely to be close substitutes. When IIA is violated the conditional probit or nested logit model is appropriate since it relaxes the IIA assumption and allows for "a general pattern of dependence among the choices" (34, p. 70).

Statistical models that omit relevant explanatory variables are subject to estimation bias. This is particularly relevant for the literature on health plan choice since many of the choice models that have been estimated include only financial variables such as price and cost-sharing requirements. Such models may have been appropriate when FFS indemnity insurance dominated the market, but in an environment in which managed care market penetration is significant and where the decision maker is not indifferent to the setting and delivery of care, models that omit other relevant variables such as plan quality or convenience may produce biased estimates (25).

Specifying the Relevant Explanatory Variables

Studies of health plan choice have included a host of variables in an attempt to identify the structural model and to explain variation in health plan choice (Table 3-1). These variables can be classified into primary and secondary variables. Primary variables are characteristics of the health plans themselves: price, quality, the degree of provider choice, the scope and breadth of benefits, and convenience. Secondary variables are characteristics of the individuals choosing the health plans, characteristics of the environment, or variables that are exogenously determined.

Secondary variables influence the weight placed on primary variables. For instance, gender may influence the weight placed on a particular primary variable such as the importance of scope of benefits covered by a health plan (51). For example, some women may be hesitant to enroll in HMOs if the plans do not offer the freedom to choose one's obstetrician/gynecologist. In this case, the fundamental reason for lack of enrollment is not gender per se, but instead is the greater salience of choice of provider for these women.

The distinction between primary and secondary variables is crucial for understanding the literature on health plan choice and selection bias and even more important for directing policy-relevant future research. Much of this literature has documented statistically significant relationships between secondary variables and the probability of enrolling in a particular health plan. These conclusions are of limited value to policy makers however, since secondary variables cannot always be manipulated to achieve policy goals. Instead, what is required is concrete evidence on the importance of primary variables as well as evidence on the manner in which secondary variables interact with primary variables in the decision making process.

3.3 Evidence from the Empirical Literature

Methodology for This Review

Table 3-2 lists the studies included in this review. Studies were chosen by conducting data base searches in Medline and the Journal of Economic Literature's Index of Economic Articles, on papers pertaining to health plan choice published in peer-reviewed journals. Studies were also selected from the bibliographic references of these papers. In some cases recent working papers were also included in the analysis.

Evidence on Primary Variables

Price

Almost all authors found price to have a statistically significant negative effect on the probability of enrolling in a health plan. It is, however, difficult to compare the magnitude of estimated price elasticities across studies. First, studies vary greatly in how price is measured. For example, some studies use the total plan premium, whereas other studies use the portion of the premium paid explicitly by the employee (hereafter referred to as employee contribution). Still other studies use a measure of the loading fee, which technically is the "true" price of a plan since the loading fee represents the portion of the premium that exceeds the actuarially fair value of the insurance policy.

Second, the choice sets analyzed in the various studies are different. The choice sets range from choice among a set of HMOs, between HMOs and FFS plans, or choice sets that includes HMOs, PPOs, and FFS plans. Third, the types of choices analyzed differ. Some analysts include information on all alternatives in the choice set, whereas others focus on plan switches or plan disenrollment without attention to well-specified alternatives. In this review, we have summarized the findings on price by grouping together studies that model comparable choices.

Studies of plan disenrollment/plan switching

Disenrollment studies model the probability that individuals retain the same coverage as the previous year without saying anything about what plans those who disenroll move to. Plan-switching studies model the probability that individuals will switch from one plan to another. The latter studies generally have information on the set of plans that switchers may move to, but do not always know which plan in this set switchers enroll in. Several important disenrollment/plan switching studies have been reported.

Buchmueller & Feldstein (3) report on a natural experiment that occurred at the University of California between 1993 and 1994. During the 1994 enrollment period the university shifted from paying the full premium for almost all health plans to paying a fixed amount set equal to the lowest price plan. Plan-switching models were estimated for the entire sample and for HMO enrollees only, for each of three enrollment categories (single coverage, two-person coverage, and family coverage). Plan switching was modeled as a function of the change in employee contribution between the two years, demographic characteristics of the employee, characteristics of the health plans, and a variable indicating which plan the employee was enrolled in during the previous year. Buchmueller & Feldstein found that individuals facing premium increases of $10 per month were about five times as likely to switch plans as those whose employee contribution remained constant. HMO enrollees also appeared to be more price sensitive than were FFS enrollees when monthly employee contributions were greater than $10.

Long et al (32) estimated a model of HMO disenrollment using 1984 data from three HMOs and 27 employers in the Minneapolis-St. Paul area. They found that a $5 per month increase in relative employee contributions around the mean value raised the disenrollment rate from 4.2% to 7.0%. This is much smaller in magnitude than the findings of Buchmueller & Feldstein (3) who estimate that, for the same increase in monthly employee contributions, the probability of plan switching would increase from 5.2% to 25%. Some of the differences may be due to unmeasured plan attributes. For example, one would expect that the University of California employees would be more

sensitive to price since the benefits packages were standardized and many of the plans used the same network of physicians.

Long et al also found that raising the number of health plan choices from the mean of five plans to six plans increased the predicted disenrollment rate by 13.4% from 4.2% to 4.7%, all else held constant. This evidence indicates that HMO disenrollment may increase as more substitute health plans are made available to employees. Some studies have examined health plan disenrollment for special sectors of the population. For example, Stearns & Mroz (53a) analyzed plan disenrollment for those enrolled in state health insurance risk pools. Harrington et al (24a) studied disenrollment from Social/Health Maintenance Organizations by elderly Medicare beneficiaries. Both studies find that disenrollment is positively related to required out-of-pocket premiums.

Studies where plan alternatives are identified

Unlike plan disenrollment or plan-switching studies where little is known about the attributes of the plan alternatives that an individual may choose from, or which plans switchers enroll in, some studies have explicitly controlled for the attributes of some or all of the plans in an individual's choice set.

Short & Taylor (53) used 1977 National Medical Care Expenditure Survey (NMCES) data to estimate two different models of health plan choice as a function of the relative plan premiums and other demographic and health plan characteristics. The first model examined the choice of 240 employees who chose between FFS and HMO coverage. The second model examined the choices of those employees who chose between a high- and low-option FFS indemnity plan.

Short & Taylor found that the probability of plan enrollment is inversely related to employee contribution. They also found that the decision to enroll in an HMO was about half as sensitive to differences in employee contributions as the choice between enrolling in a high- and low-option FFS indemnity plan. Specifically, they calculated that for each $100 in the relative difference in the annual employee contribution of an HMO (relative

to a high-option FFS plan), the likelihood of enrollment dropped by 2.6% as compared to a drop of 5.3% for the decision to enroll in a high-option FFS plan with the same $100 difference (relative to the low-option FFS plan). Short & Taylor speculate that the difference in price sensitivity may be due to the fact that HMO enrollment represents a choice of physician and delivery arrangement as well as a method of financing the cost of medical care.

Barringer & Mitchell (1) analyzed 1989 data from employees of a large manufacturing firm who were offered a choice between a catastrophic plan, two traditional FFS plans that varied in deductibles and copayments, and a prepaid health plan. The authors conclude that health plan enrollment is sensitive to price, and they report price elasticity estimates in the range of -0.1 to -0.2. Specifically, the authors found that the majority of those moving away from the traditional FFS plan would prefer a high-premium prepaid plan offering low cost-sharing provisions relative to a lower-priced, lower-coverage FFS plan.

Welch (60) used 1981-1982 data from the Bureau of Labor Statistics annual survey of employee benefit plans to estimate own and cross price elasticities of demand for Prepaid Group Practice (PGP) enrollment. The unit of analysis was the firm, and the dependent variable was the percentage of employees at a particular firm that enrolled in a PGP. Explanatory variables included were the employee contributions for both the conventional FFS plan and the PGP, deductibles, maximum out-of-pocket expenditure limits, copayments, and whether the plans covered vision, dental, and prescription drugs. Since analysis was done at the firm level, Welch also included several variables such as industry group and regional market characteristics that may have affected firm-level PGP market share.

Welch estimated own price elasticities of PGP enrollment at the mean employee contribution to be -0.20 in the short run and -0.62 in the long run. Cross price elasticities for the change in the probability of PGP enrollment given the change in the employee FFS contribution were estimated to be 0.16 and 0.49 respectively.

McGuire (43) studied the health plan enrollment choices of more than 900 single employees who had been employed at Yale University for at least two years as of June 1974. He separately estimated the probability of enrolling in either the Blue Cross (BC) plan, the Yale Health Plan (YHP)--a PGP, or choosing no employer-sponsored coverage; and the probability of enrolling in the YHP conditional on enrollment in either the BC or YHP. Generally speaking, the YHP offered more comprehensive coverage and restricted provider choice relative to BC.

McGuire found that the employee contribution was a significant variable in estimating the probability of enrollment in the YHP given that either the BC or YHP option was chosen. However, price was not a significant predictor in the decision to choose one of the two options vs. choosing no coverage, perhaps because external sources of coverage were unobserved. Estimated cross price elasticities indicated that a one dollar increase in the BC premium increased the probability of joining the YHP by about 4%, all else held constant.

Marquis & Long (38) found that price was inversely related to the probability that individuals would purchase health insurance vs. remaining uninsured. However, because the estimated price elasticities were small, implying very inelastic demand for health insurance, they concluded that price incentives or premium subsidies may not be enough to induce large numbers of the uninsured to purchase coverage. This finding is important because it suggests that price incentives may not be as effective in encouraging the uninsured to voluntarily purchase health insurance as in changing the plan distribution of those who are already insured.

Feldman et al. (16) used 1984 data from a survey of employees at 20 firms in Minneapolis, Minnesota, to estimate a nested logit model of health plan choice. Two nests were defined (one consisted of all FFS and IPA plans; the other of all HMOs). After defining health plan nests, Feldman et al estimated two separate conditional choice models and found that price was an important predictor of health plan choice, but that HMO enrollees appeared to be more sensitive to employee contributions than were

IPA/FFS enrollees. This finding is consistent with results from the Buchmueller & Feldstein study (3).

Until now, the discussion has focused primarily on employment-based health plan choice. Indeed, most of the evidence in the published literature focuses on this population. However, several authors have looked at the choice of enrollment in supplemental health insurance plans. Two types of supplemental plan purchases that have been examined are Medicare Supplemental policies (Medigap policies) and hypothetical supplemental insurance policies that reduce one's exposure to financial risk by covering deductibles and copayments that may exist if medical care is required.

Rice et al. (50) used information on past employment of the elderly as a proxy for the price of a supplemental (Medigap) policy, by distinguishing among employers who were likely to subsidize the purchase of a supplemental policy from those who were unlikely to subsidize the purchase of a supplemental policy. The authors used this measure as an explanatory variable in modeling the probability of owning a Medigap policy. The findings from this study suggest that the probability of owning one or more supplemental policies is positively and significantly related to the likelihood that one's employer subsidizes all or part of the purchase.

Marquis & Phelps (39) presented a sample of participants in the RAND health insurance experiment (47) with hypothetical supplemental insurance offers to cover financial exposure to deductibles and copayments. The authors estimated the probability of a full supplemental health plan purchase as a function of the estimated loading fee and found an elasticity estimate of -0.6.

Quality

The concept of quality has only recently taken on practical meaning in the individual's decision to enroll in a particular health plan because of the growth of delivery system (provider) restrictions associated with many health plans. Moreover,

standardized and publicly reported data on health plan quality have only recently become available (55--57).

There are a handful of empirical studies that attempt to examine the importance of quality on health plan choice. Most of these studies do not observe data on quality directly but rely on proxies that are assumed to be closely correlated with quality.

For instance, Rice and colleagues (50) modeled the probability that a Medicare-eligible individual who purchased a supplemental health insurance policy would purchase an "effective" or "high-quality" plan where the effectiveness of a plan was determined according to a set of criteria specified by the authors. They found that those with higher incomes and those who worked for employers who provided insurance were more likely to purchase more effective plans. Persons with higher levels of education and those with greater familiarity with the Medicare system were also more likely to purchase effective policies.

Recognizing the bias that may result from omitting unobserved relevant explanatory variables such as quality from models of health plan choice, Harris (25) proposes treating quality as a latent variable when general information on perceived plan quality is available. Harris uses data obtained from a 1988 preference survey of elderly Medicare beneficiaries in the Minneapolis-St. Paul area. The survey asked beneficiaries to rate the importance of specific health plan attributes such as plan price and cost sharing, convenience, benefit coverage, provider choice, and quality of care, in the context of choosing a health plan. Harris estimates a logit model of health plan choice between traditional Medicare coverage, Medicare coverage with a Medigap supplement, and managed-care Medicare coverage.

Using this imperfect measure of quality as a latent variable combined with data on the actual Medicare plan choices made by survey respondents, Harris finds that the elderly perceive managed-care options to be of lower quality than the traditional Medicare FFS option with a Medigap supplement. Moreover, Harris finds that including quality as a latent variable significantly changes the estimates obtained when the quality variables are not included in the model. Harris therefore concludes that it may be better to

include noisy measures of quality in models of health plan choice than no measure of quality at all.

The problem with most of the existing studies on quality and plan choice is that they are indirect tests at best of the importance of quality on health plan choice. No studies directly examine the effect of providing consumers with information on plan quality. This evidence is sufficiently sparse to prevent one from making any firm conclusions about the possible outcome of any policy whose success relies on consumer use of comparative information on health plan quality.

Choice of Provider

Health plans generally differ widely in the degree of flexibility offered to enrollees in choosing providers. HMOs, in general, restrict choice to the providers with whom they have contracted. FFS plans do not. Furthermore, individuals and families often have established relationships with physicians they might have to give up if they changed health plans. However, despite its obvious importance, few studies have empirically examined provider choice when modeling health plan enrollment.

One exception is the study by Feldman et al. (16), which estimated a nested logit model of health plan choice where the two nests were defined by the ability of the insured to choose his or her provider. They found that changes in price for any given plan were more likely to shift enrollees to plans with similar characteristics of provider choice, suggesting that plans with restricted provider choice are closer substitutes to one another than are plans with unrestricted provider choice. However, without a variable indicating a scale of provider choice, it is difficult to directly determine the value that enrollees place on this attribute relative to other primary variables such as price.

Perhaps a better measure of the importance of provider choice is whether one has a usual source of care or an existing physician relationship. For example, Juba et al. (30) found evidence that close personal ties to a doctor decreases the probability of joining an HMO. Grazier et al. (23) found that the major predictor of switching from a Blue Cross

FFS plan to an IPA was presence of the families usual physician on the IPA's physician list. Grazier et al also found that satisfaction with one's usual source of care is a strong predictor in the decision to leave a group model HMO for an IPA.

Benefit generosity—Breadth of plan coverage

The benefits of a health plan can vary in types of services covered (i.e. prescription drugs), units of services covered (e.g. 20 outpatient mental health visits per year), or the extent of patient cost-sharing (an HMO may charge a $5 copay per visit, whereas the FFS plan may charge the full price of the visit up to the annual deductible, and then 20% of the cost of the visit thereafter up until the annual out-of-pocket maximum). In many cases, benefit generosity and breadth of plan coverage is not an important variable to consider when modeling health plan choice since the benefit package across health plans for a particular employer is often standardized. However, when benefits are not standardized, it is necessary to consider the benefit differences when modeling health plan choice.

In general, two conclusions can be made about the importance of benefit generosity in the decision to enroll in a health plan. First, consumers tend to value greater benefit generosity over less benefit generosity, all else held constant. Second, certain benefits are more salient to some individuals than to others. The latter point is closely related to studies of selection bias (discussed below).[3]

Short & Taylor (53) looked at the choice between a high- and low-option FFS plan as a function of differences in hospital coinsurance, the inclusion of dental and prescription drug coverage, outpatient mental health coinsurance, major medical stop-loss, and the outpatient physician deductible. The authors found that more generous benefits, in particular dental and mental health coverage, increased the probability of enrollment in an HMO vs. a traditional FFS indemnity plan.

[3] For a more detailed review, see (26, 27).

Feldman et al. (16) modeled health plan choice as a function of whether a plan covered preventive care, outpatient and inpatient deductibles, coinsurance, and stop-loss. The authors found evidence that the coverage of preventive care is positively related to plan choice. Welch (60) modeled PGP enrollment as a function of the difference between PGPs and conventional plans in terms of outpatient copayments, dental coverage, vision coverage, drug benefits, deductibles, and yearly out-of-pocket expenditure limits. Welch found that the PGP copayment is negatively and significantly related to the firm-level PGP enrollment rate. The coverage of vision and prescription drugs were found to be positively and significantly related to the PGP market share within a firm.

Robinson and colleagues (51) examined pre- and post-hospital admissions and inpatient days for Bank of America employees enrolled in either the FFS plan or the Kaiser HMO for the period of 1981--1984. Using the several years of data, they compared the utilization patterns for maternity admissions and non-maternity admissions of those switching from the FFS plan to the HMO with those remaining in the FFS plan and those remaining in the HMO. The authors found that employees frequently switch health plans in anticipation of future maternity needs but not so much for other services. They conclude that maternity benefit coverage is a more salient variable for employees and dependents in the childbearing years, and that the difference between the FFS plan and the HMO in coverage of this benefit influences health plan enrollment among this group.

Finally, Deb and colleagues (7) compared the health plan choices of families who reported having at least one family member with a mental illness with the health plan choices of families who reported no family members with mental illness. Using data from the 1987 National Medical Expenditure Survey (NMES), they found that families who report having at least one family member with a mental illness are more likely to choose an HMO than a full-service FFS plan or a catastrophic plan, but that the significance of this finding depends on model specification. They conclude that the difference in plan choice among those reporting differences in mental health status may be due to differences in the generosity of mental health benefits between plan types.

Convenience

Convenience measures plan characteristics such as distance to providers, ease of getting an appointment, average waiting time, burden of paperwork, and claim filing, etc. Like quality, data on the convenience of a health plan have obtained more meaning with the growth of HMOs and other types of managed care plans. For instance, if waiting times are long, an HMO enrollee may not have the same luxury of seeking a provider with a shorter wait that a FFS enrollee may have.

The importance of convenience for health plan choice is not well understood. LaTour et al. (31) report evidence from surveys of Medicare beneficiaries that the likelihood of health plan purchase would increase if office visit waiting times were lower under alternative Medicare plan offerings. However, only a few enrollment studies have measured the relative importance of convenience, and their findings do not indicate that this variable is very important.

Feldman and colleagues (16) included variables capturing the number of days that a patient must wait for a routine or an illness appointment and the average amount of time a patient must wait in the doctor's office on the day of the appointment. However, they found conflicting results for these measures of convenience. Juba et al (30) model the probability of HMO enrollment as a function of the amount of travel time in minutes to the providers of care and find that the farther the providers are from an individual's residence, the less likely that one will enroll in the HMO. The coefficient on this estimate is not significant, however.

Evidence on Secondary Variables

Ideally, to assess the effect of secondary variables, one should include interaction terms in models of health plan choice. These statistical interactions would estimate how important certain plan features (i.e. primary variables) are to given individuals. In this case, the coefficients on these interaction terms would provide useful information to policy makers such as how older and younger people differ in their sensitivity to out-of-pocket premiums or how the ability to choose one's provider is valued differentially by

gender. However, in most models of plan choice, the secondary variables are entered directly as explanatory variables. Specified in this manner, the coefficients on the secondary variables provide descriptive information about who enrolls in which types of plans, but the structural reason why these individuals are attracted to certain plans remains unknown.

Many secondary variables have been included in studies of health plan choice, as Table 3-1 illustrates. These variables are generally included because they are proxies for the health status of an individual (age) or because it is believed that preferences for health plans differ in ways related to these secondary variables (gender).

Most studies have found that patterns of health plan enrollment (HMO vs. FFS enrollment) vary by groups who differ in particular secondary variables such as age, gender, or health status. Feldman et al. (16) provide some information about why these variables are important. They interact gender with whether a plan covers preventive services and find that although all employees value preventive services, females value these services more than males do. The authors also interact age with a dummy variable that indicates the degree of provider choice offered by a plan. They find that older people tend to prefer plans that offer greater flexibility of provider choice. Marquis & Long (38) find evidence that low-income families are more sensitive to price than higher-income families are. Barringer & Mitchell (1) find that women are more likely to select the catastrophic coverage option relative to the prepaid health plan or FFS plans with lower deductibles.

The secondary variable that is perhaps of most interest is health status. As Table 3-1 indicates, many measures of health status have been included in studies of health plan choice. However, health status is generally not interacted with primary variables in these studies and therefore the results do not indicate why people in better or poorer health sort themselves into particular kinds of plans.

Hellinger (26, 27) recently reviewed the literature on selection bias in health plan enrollment and concludes that health plans that restrict choice of provider generally experience favorable selection (i.e. healthier people tend to enroll in HMOs). These

conclusions are usually based on correlation between differential patterns of enrollment and differential patterns in prior health care utilization, medical care expenditures, or health status. In general, the results are consistent regardless of whether the population for whom enrollment is being examined is the elderly or non-elderly. However, some studies do not find evidence of selection bias in favor of HMOs (33, 35, 44, 61).

Future research should seek to bridge the gap between studies of health insurance choice and studies of selection bias in insurance plans by interacting primary and secondary variables. Luft & Miller (33) and Giacomini et al. (21) argue that such information is absolutely essential to adjust premiums for risk and to "design an environment in which people have the opportunity to choose the health plan that best meets their needs while plans are adequately compensated for the resulting differences in risk" (33, p. 117)

3.4 Discussion: How can the Current Literature be used for Policy Analysis and what New Evidence do we need?

The strongest conclusion to be drawn from the existing literature on health plan choice is that price, regardless of how it is measured, is significant and negatively related to the probability of choosing a health plan (or positively related to the probability of switching or disenrolling from a health plan). This conclusion is important because it suggests that perhaps the most effective way to change the distribution of health plan enrollment in a particular group (from, say, FFS coverage to HMO coverage) is to offer price incentives to encourage voluntary movement between plans. Less is known about how price interacts with other potentially important primary variables such as plan quality, convenience, breadth of coverage, and provider choice. Very little is known about how secondary variables interact with price and how this interaction causes some groups to "select" into certain types of health plans. Future research should strive to examine these interactions to obtain a more accurate depiction of how biased selection differs with sensitivity to price and other primary variables.

Second, more evidence is greatly needed on how the provision of health plan "quality" data influences health plan choice. There has been a widespread movement recently by health plans, employers, and even the federal government, to provide consumers with comparative information to use when making health plan choices (55--57). Yet virtually nothing is known about whether consumers respond to this information, and if they do respond, in what manner. Future research must assess how important this information is in health plan enrollment decisions. Moreover, the inclusion of this information in models of health plan choice, insofar as it is relevant to the decision making process, will allow for more accurate estimates of the impact of price on plan enrollment.

Third, a better link is needed between the literature on health plan choice and on biased selection. As discussed above, the literature on plan selection has generally concluded that health status is an important indicator of health plan choice without actually modeling the interaction between health status and other primary attributes of health plans. Therefore, we are only able to conclude that certain types of people tend to enroll in particular health plans, instead of being able to explain more conclusively what attributes of health plans some people value more than others.

Fourth, a methodological problem with many existing studies is that the data used do not capture all of the health plan alternatives available to a given individual. For example, studies modeling the probability that one will join an HMO may say little about which HMO one may join or which FFS option one might choose if one did not join an HMO. As Feldman et al. (16) point out, the most insightful studies of health plan choice use conditional or nested choice models and contain information on the attributes of all of the plans from which an individual chooses. Future studies of health plan choice should study samples where data on the entire menu of plan options are available to the researcher. Estimates generated from such studies tend to be more robust to permutation in sample (20) and are valuable to policy makers contemplating changing the choice set of an enrolled group such as what Congress has considered with Medicare (54, 59).

Finally, in setting forth an agenda for future research, it is worth mentioning a few additional limitations of the existing literature for policy analysis. First, the data used in many studies (as illustrated in Table 3-1) are often quite old given the numerous changes in the product market for health insurance over the past 15 years. More current data are needed since the nature of the choice set of most individuals with employment-based health insurance has changed dramatically. Furthermore, as people have gained knowledge of managed care, their preferences may have changed.

Generalizability of the findings may also be a problem because data for many studies are from a select number of cities (such as New Haven or Baltimore). The results from these studies may not be generalizable if the underlying preferences of the consumers in the cities studied differ from the preferences of individuals in other regions of the country. For example, if policy makers believe that consumer acceptance of managed care is much different in California than in the southern states, estimates from California should be used cautiously to evaluate policy in the south. Future research should use data that include a wide geographic sample of individuals to allow regional comparisons and generalizability on a national level.

In addition to regional generalizability, it is also necessary to obtain results that are generalizable to specific populations. For example, there has recently been talk in Congress and the press about increasing competition in the Medicare market by increasing the number of health plan choices and by providing comparative information on the available choices. Unfortunately, little is known about how consumers in general would respond to such information, and even less is known about how the elderly in particular would respond, or whether or not the elderly would respond differently than the general working population. Specific information is needed on individual groups, such as the uninsured, the self-employed, retirees, and the Medicaid population, to gauge the likely effect of the competitive strategy on these specific populations.

In conclusion, our existing knowledge of health plan choice—that price is an important variable in the decision making process—was sufficient for the time when FFS coverage dominated and consumers paid very little out-of-pocket for health plan

coverage. However, with the widespread growth and acceptance of managed care and with a greater proportion of consumers' income going toward the purchase of health plans, this knowledge is no longer sufficient. Accurate evaluation of health plan choice in today's sociopolitical environment requires deeper understanding of how primary variables other than price influence plan choice, how secondary variables interact with primary variables in the decision making process, and how specific populations differ from one another in the sensitivity of their health plan choices to these different types of variables.

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Table 3-1: Variables Included In Studies of Health Plan Choice

Primary Variables	Secondary Variables
Price	***Demographic characteristics***
Total plan premium	Educational attainment
Employee contribution	Family size and composition
Insurance loading factor	Age
Tax rates	Gender
Purchase of insurance subsidized by employer	Family income
Insurance provided as part of an insurance benefit plan	
Quality	***Health status***
Effectiveness of health plan	Anticipated future health
Reported problems with plan administration	Prior year hospitalization
Patient satisfaction	Utilization of medical care services
	Presence of usual source of care
Choice of provider	Presence of chronic conditions
Physician restrictions	Number of non-OB hospital admissions
Hospital restrictions	Conditions currently under care
	Mental health status
Benefits/coverage breadth	Previous major utilization episode
Deductible amount	Number of OB hospital admissions
Co-insurance/copay amount	
Maximum stop loss amount	***Exogenous economic variables***
Covered inpatient/outpatient services	Per capita income
Dental coverage included	Metropolitan statistical area variables(MSA)
Mental health coverage included	
Drug coverage included	***Other secondary variables***
Long term care coverage included	Length of residence in a city
	Number of health plans in choice set
Plan convenience	Familiarity with Medicare/insurance policy
Satisfaction with out-of-pocket costs	Existence of other health plan coverage
Travel time to physician or hospital	
Appointment waiting time	
Length of time to appointment	

Table 3-2: Empirical Studies of Health Plan Choice by Publication Date

Authors	Date of Publication	Data Source
Buchmueller & Feldstein	1996	1993-1994 enrollment data from the University of California system
Deb et al.	1996	1987-1988 National Medical Care Expenditure Survey (NMES)
Harris	1996	1988 survey of Twin Cities Medicare beneficiaries
Hibbard & Jewett	1996	1995 focus group data from Eugene, Oregon
Newcomer et al.	1996	1985-1988 sample Social/HMO members
Robinson & Gardner	1996	1987-1990 personnel data from a large California company
Davis et al.	1995	1994 Commonwealth Survey of families in three cities
Marquis & Long	1995	1988 Current Population Survey (CPS) and 1987 Survey of Income and Program Participation (SIPP)
Stearns & Mroz	1995	1988-1991 data from eight state risk pools
Dowd & Feldman	1994-1995	1988-1993 data from five large Twin Cities employers
Barringer & Mitchell	1994	1989 payroll and benefit records from a large national manufacturing firm
Dowd et al.	1994	1987 HCFA survey of Twin Cities Medicare beneficiaries
Harrington et al.	1993	1986-1988 sample of Social/HMO members
Robinson et al.	1993	1981-1984 personnel data from Bank of America employees
Chulis et al.	1993	1991 Medicare beneficiary survey and administrative records
Marquis	1992	1974-1982 data from RAND health insurance experiment (HIE)
Shur and Taylor	1991	1977 & 1987 National Medical Care Expenditure Survey
Dowd et al.	1991	1984 survey of 20 Minneapolis firms
Rice, McCall and Boismier	1991	1982 survey of 2,500 Medicare beneficiaries in six states
Ellis	1989	1982-1983 data from a large financial services firm
Feldman et al.	1989	1984 survey of 20 Minneapolis firms
Short and Taylor	1989	1977 National Medical Care Expenditure Survey
Huang, Cartwright, and Hu	1989	1977 National Medical Care Expenditure Survey
Long et al.	1988	1984 sample of 1,553 subscribers in 3 Minneapolis-St. Paul HMOs
Marquis and Phelps	1987	1,326 families participating in the RAND HIE
Marquis and Holmer	1986	1974-1982 data collected as part of the RAND HIE
Grazier et al.	1986	1978 data from 1,497 families who had a member employed by the state of Washington
McCall, Rice, and Sangl	1986	1982 HCFA survey of 2,500 Medicare beneficiaries in six states
Latour et al.	1986	1982 national survey of 2,016 non-institutionalized Medicare beneficiaries
Welch	1986	1981-1982 Bureau of Labor Statistics survey of employee benefit plans of medium and large firms
Neipp and Zeckhauser	1985	1985 health plan enrollment data from Harvard and Polaroid
Cafferata	1984	1977 National Medical Care Expenditure Survey
Holmer	1984	1982 survey of federal employees in the Baltimore-Washington area
McGuire	1981	1974 data of single employees at Yale University
Juba, Lave, and Shaddy	1980	1976 survey of employees at Carnegie Mellon University

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Chapter IV
Data

4.1 Samples Analyzed

Data for this study were obtained from a Fortune 100 company insuring 328,826 active employees, retirees and their dependents. The data pertain to their choice of health plan for the calendar year 1995.[1] At this firm health plan enrollment is part of a flexible benefits system where employees and retirees receive "flex dollars" and allocate these dollars as they see fit across several possible benefit categories (i.e., health insurance, life insurance, disability insurance, dental insurance, etc.).[2] Within each benefit category there are various options. If the cost of one's total benefit elections exceeds one's flex dollars, the difference is paid out-of-pocket. If the cost of one's benefit elections is less than one's flex dollars, the difference is received as taxable income. The out-of-pocket premium required of employees is used in this study.[3] The out-of-pocket premium is not equal to the true premium charged by the MC plan. Instead, since health benefits are part of a flexible benefits program, the out-of-pocket prices charged were based in part on the amount of flexible benefit dollars available to employees.

The determination of the set of plans from which enrollees can choose and the associated out-of-pocket prices was made by the firm's various business units and differed by location. Markets are constructed that consist of individuals who share the same set of managed care (MC) plan options and face the same set of prices for each plan. Estimation is conducted separately for active employees and retirees because of differences in age and health status. Furthermore, retirees are separated by Medicare eligibility (age greater or less than 65) since MC enrollment is clearly not a similar choice for both groups. Active employees are separated by union status, number of dependents covered, and whether the employee was newly employed by the firm or switched from FFS to MC coverage between 1994 and 1995. The union membership distinction is made because blue collar and white collar workers may differ in their insurance preferences.

[1] Open enrollment for 1995 was conducted in the fall of 1994.
[2] The amount of flex dollars allotted to each employee depends in part on the type of health insurance coverage chosen (single, family, etc.) and in part on the employee's business unit. This is similar to the University of California system as described by Buchmueller and Feldstein (1997).
[3] The out-of-pocket premium is observed in pre-tax dollars.

Employees are categorized by number of dependents covered because, for example, families with children may have different preferences for providers and services (e.g. pediatricians) relative to single employees. New employees are examined separately because they are choosing a plan via the firm for the first time and may be more likely to use the provided ratings. Similarly, plan switchers are choosing a new type of coverage (i.e. MC instead of FFS) and may also be more likely to consult the ratings provided by the firm.

Share regressions and conditional logit models (described in detail in Chapter V) are estimated for the following six samples of MC choosers: a) active non-union employees choosing single coverage b) active non-union employees choosing family coverage; c) active union employees choosing single coverage; d) Medicare eligible retirees; e) non-Medicare eligible retirees; f) a pooled sample of Medicare and non-Medicare eligible retirees. Conditional logit models are estimated for the same six samples and: g) new hires (active non-union employees choosing single coverage via the firm for the first time) and h) switchers (active non-union employees choosing single coverage and switching to MC from FFS coverage between 1994 and 1995).[4] Dependents are not included in any of the analyses because the vast majority of dependents chose the same plan as the employee or retiree.

The analysis is restricted to MC enrollees (HMO or Point of Service (POS) plans) because HEDIS measures and plan performance information were not available for the FFS plans. The share regression analysis is constrained to workers in markets with at least 20 employees because the share regressions may be sensitive to plans with very large or small shares, which occur with some frequency in small markets.[5] The coefficient estimates are similar if the sample is restricted to markets with at least 30 employees.

Table 4-1a illustrates the sample breakdown. The restriction to eligible employees and retirees reduces the sample to 150,775, of which 89,148 are active employees and 55,592 are retirees. Active employees are further broken down by union status (47,178 non-union employees and 41,970 union employees) and coverage category

[4] Share regressions are not estimated for the new hire and switcher samples due to small market sizes.
[5] For the retiree samples, markets with less than 20 retirees are included in the analysis because of sample size concerns.

selected (single or family coverage). Retirees are separated into those who were eligible for Medicare (28,458) and early retirees who were not eligible for Medicare (27,134) based on age.

The sub-samples eligible for inclusion in the analyses are represented by the shaded cells in Table 4-1a and include all individuals in the above mentioned groups who chose MC coverage. The actual number of individuals that are contained in the analyses differs from the shaded cells in Table 4-1a because active employees from markets with less than 20 employees, and individuals with only one choice, were excluded. Table 4-1b lists the exact sample sizes for all eight samples that are analyzed. The sample sizes for the "new hire" and "switcher" analyses are shown in Table 4-1b only. All new hires and switchers are contained in the analyses regardless of market size, because only conditional logit models are estimated for these samples. Comparing enrollment data sets from 1994 and 1995 identified the new hire and switcher samples.[6]

4.2 Health Plan Characteristics

The company required a standard benefit package from all managed care plans with which they contracted. This minimizes the concern that omitted aspects of the benefit design will bias the findings. In some cases there are variations in certain aspects of coverage such as the amount of the pharmaceutical copayment, the generosity of mental health coverage, and the rules regarding selection of primary care physicians and referrals. Because a metric for valuing these diverse differences across plans was not available, they are not included in the analysis. However, the examination of outliers considers these differences across plans.

The plans differed widely regarding the nature of their physician networks. In particular, the size of the network may be related to the degree of physician choice that enrollees enjoy. However, the size of the physician network may be an imperfect measure of physician availability since not all physicians in a plan may be accepting new patients. Because the plans in the sample serve geographic areas that vary widely, panel

[6] New hires are defined as those with positive enrollment records in 1995, but not in 1994. Switchers are those individuals identified as choosing FFS coverage in 1994 and MC coverage in 1995. Switchers may also be included in one of the other six samples depending on eligibility type (employee or retiree), union status and age.

size is measured relative to aggregate plan enrollment (enrollment from all purchasers including the study employer). It was hypothesized that, all else equal, employees will prefer plans with more physicians per enrollee because this reflects less of a restriction on physician choice at the time of illness. The source for the data on physicians to enrollees was the firm, which relied on data provided by the plans. In a few cases data were missing or appeared erroneous, in which case data from the 1995 Interstudy Competitive Edge were substituted.

Plans also differ in the extent of control that they exert over physicians. Strongly integrated plans such as group or staff model HMOs typically exhibit a tight relationship (integration) between the provider panel and insurance plan. IPA model HMOs and POS plans exhibit less integration. Network model plans lie somewhere in between. Employees may be concerned about the extent of integration between the plan and physician because it may affect the incentives and behaviors under which the physicians practice. Historically, one might hypothesize that employees would be wary of very tightly integrated plans because physicians in those plans had somewhat less autonomy and were not subject to the market discipline of serving patients from outside of the plan. However, with the growth of capitated payment systems in the less integrated models, it is less clear which model type employees should prefer.

Coding of the extent of plan integration was based mainly on data provided by the firm, though the data were checked against the 1995 Interstudy Competitive Edge data. When there were disagreements, plans were contacted regarding their model type. Group and staff model plans were considered integrated. IPA model HMOs and POS plans were coded as 'not integrated.' Coding of network model plans and mixed plans was more complex and was based on the dominant model within the plan if available, or, as a last resort, based on the plan's panel size (large panels are generally characteristic of less integrated plans) [Marion Merrell Dow, (1994)].

4.3 Health Plan Report Card Ratings

The company that provided the data for this study required the health plans with which it contracted to report HEDIS 2.0 data to the firm. HEDIS stands for the Health Plan Employer Data and Information Set, which is a standardized data set developed by a

coalition of employers and health plans in 1989. HEDIS is the most widely used data system for health plan evaluation and has undergone several revisions. The latest version, HEDIS 3.0, was released in the fall of 1997.

Initial versions of HEDIS contained process measures (e.g. percentage of pregnancies receiving pre-natal care in the first trimester). Each revision of HEDIS attempted to standardize and refine the set of measures used. For example, version 2.5 made changes to the methodology for the calculation of specific measures (e.g. diabetic retinal examination rates). HEDIS 2.5 also dropped certain measures because of lack of clinical agreement (e.g. cholesterol screening rate for adults ages 20-39).[7] Unlike earlier versions, HEDIS 3.0 contains a standardized satisfaction survey facilitating the comparability of satisfaction comparisons across plans.[8] Although most process measures from prior versions of HEDIS are included in version 3.0, some additional measures, including outcome measures have been added for the first time.

The firm used the reported HEDIS data to rate plans as 'superior' or not on five domains that were labeled as follows: physician quality, surgical care, medical treatment, employee satisfaction, and preventive care. Each domain was comprised of several specific HEDIS measures using a methodology developed by the firm (Table 4-2).

The rating for each plan, for each domain, was based on an index score assigned relative to the index scores of other plans in the same region of the country. The index scores for each domain were calculated by summing a plan's "point scores" for each of the measures making up a given domain. Points were assigned for each measure on the basis of the plan's performance on that measure relative to an industry or national standard. For example, the surgical care domain was made up of the following measures: the coronary artery bypass graft surgery rate, hysterectomy rate, cesarean section rate, laminectomy rate, cholecystectomy rate, cardiac catheterization rate, and the number of

[7] For example, HEDIS 2.0 required the calculation of cholesterol screening measures for two separate populations; adults between the ages of 20-39 and adults between the ages of 40-64. HEDIS 2.5 eliminated the measure for younger adults due to "lack of consensus in the medical community on the cost-effectiveness of cholesterol screening in the younger group" [HEDIS 2.5, (1995)].

[8] Prior to version 3.0, health plans were simply required to administer a satisfaction survey, with no standardization of the survey instrument across health plans required.

general hospital acute care days per 1,000 members.[9] The benchmark used for scoring in this domain was the 1991 Group Health Association of America (GHAA) data. Plans with performance 'better' than the 1991 GHAA national median received 10 points for that measure. Plans with scores that were in the second lowest quartile of the GHAA data received 5 points for that measure. Plans with measures that were in the bottom GHAA quartile or plans that did not report data received a score of zero for that measure.[10] The raw domain score was then calculated by dividing the domain point total by the number of measures in the domain, which was 7 in the case of surgical care. Finally, plans that had domain scores that were in the top 25 percent of all plans in their respective region were labeled as 'superior' on that domain.

During the 1995 open enrollment period (fall 1994), employees were given information sheets for each plan in their choice set. These sheets were designed to be easy to understand and conveyed the information used in the analysis including the out-of-pocket price, the relative size of the physician panel, degree of integration (model type), and the report card ratings for each of the five domains (superior or not).

The report card ratings outlined above are clearly imperfect measures of plan quality. Many of the important aspects of quality identified by researchers are captured imperfectly if at all in these ratings.[11] Moreover, the scoring methodology and the process of aggregating the measures to form domain ratings may do a poor job of valuing plan attributes from the perspective of enrollees [Scanlon et al. (1998)]. For example, in the surgical care domain, 'better' is assumed to be 'fewer.' Despite some evidence that the surgical procedures measured in HEDIS are overused, no attempt is made to measure appropriateness or to adjust for case-mix severity. Plans with low rates of utilization of these surgeries may be plans that generally restrict access, which may be considered a negative trait by potential enrollees.

Similarly, the satisfaction domain includes measures of waiting times and the percent of physicians accepting new patients. Long waiting times and few physicians

[9] The measures of utilization are typically computed using an appropriate denominator (for example cesarean section rates are computed as a percentage of live births). However, other than these minor adjustments, the scores are not case-mix adjusted.

[10] Not all domains used the same scoring system. In some cases the standards were taken from different sources and in some cases partial credit was given for simply having the ability to report the data.

accepting new patients is considered to be unfavorable according to the firm's scoring system. Yet it may be that these measures are proxies for the popularity of the physicians in the network. Hence, within the range of observed waiting times, longer waiting times and physicians operating at full capacity may be correlated with attributes considered favorable by potential enrollees.

The satisfaction domain suffers from another problem related to the measure of 'enrollee satisfaction' (1 of 5 measures in this domain). HEDIS 2.0 relied on enrollee satisfaction measures that are based on surveys developed by each plan. Because these surveys differ across plans, satisfaction rates are not necessarily comparable. Several researchers have identified problems with the measurement of satisfaction [Allen (1995), Genovich-Richards (1995), Gold and Wooldridge (1995)]. The bias generated by these measurement issues is difficult to assess. Pure measurement error would induce a bias in the coefficient towards zero. However, there is some anecdotal evidence from the benefit managers at the firm that several well regarded plans reported relatively low satisfaction scores, apparently because their internal satisfaction evaluation process was more rigorous than the other plans.

Issues such as these arise in all efforts to measure and disseminate information on plan performance. It is important to recognize that failure to find an association between these report card measures and plan choice in this study may reflect imperfections in the report card construction process as much as employee indifference to the underlying constructs that the report cards were intended to measure.

4.4 Descriptive Statistics

The means and standard deviations for all variables contained in the market share regressions and conditional logit models for all eight samples are contained in Table 4-3. Detailed descriptive statistics, including the minimum and maximum values, for all samples can be found in Tables 4-3a to 4-3h in Appendix A. For samples a-f, the unit of observation is a unique plan/market combination. Therefore some plans are represented multiple times because they are offered in more than one market. Hence the statistics for

[11] For a detailed discussion of quality in health care see Donabedian (1980, 1988), Lohr (1990), Iezzoni (1989), Palmer (1991), Blumenthal (1996), or Wysewianski (1988).

these samples should be viewed as weighted by the number of markets in which each plan is offered. Tables 4-4a to 4-4h (in Appendix A), using a similar sampling frame, presents the correlation coefficients of the variables included in the health plan choice model for each of the samples analyzed.

For samples g-h, the unit of analysis is the mean characteristics of each individual chooser's choice set. Hence, the mean price reported in Tables 4-3g and 4-3h is calculated by first obtaining the average price faced by each individual given the choices offered by the firm, and then averaging these means across all individuals included in the respective sample. Similarly, the number of choosers per plan is calculated by averaging the mean number of persons with each plan in their choice set.

Price

As Table 4-3 illustrates, the mean out-of-pocket price charged to employees ($217 per month for active non-union employees choosing single coverage and $597 per month for active non-union employees choosing family coverage) is generally higher than the national average ($147 per month for single coverage and $401 per month for family coverage in 1994 [Hoechst Marion Roussel, (1995)]). This difference is due, in part, to the fact that the firm had a more generous benefit package. The table also illustrates that union employees face a significantly lower out-of-pocket price than their non-union counterparts (about $10 per month on average). This is due to the fact that union contracts are negotiated separately and often require zero (or low) out-of-pocket prices for union members. Retiree prices also vary, with some retirees even facing negative prices (receiving flex dollars) for enrollment in certain plans. The prices charged to Medicare eligible retirees are difficult to compare since they reflect the costs associated with the additional benefits covered by Medicare managed care plans. These benefits often include zero deductibles, coverage of preventive care and outpatient pharmaceuticals, and small copayments for other services not traditionally covered by Medicare Part A and Part B. Variations in out-of-pocket prices required of employees and retirees facilitate the direct comparison of the results across these groups.

Physician Characteristics

The number of physicians per health plan enrollee (all enrollees including those not from the study employer) ranges from 0.023-0.031 for all eight samples. This number is similar to numbers published elsewhere [Marion Merrell Dow (1994)] and includes all types of HMOs including IPAs which contract with a large number of physicians and physician groups. Approximately 30 percent of the health plans in each sample were coded as exhibiting a tight degree of integration between physicians and the HMO (i.e. staff and group model plans). This number is also consistent with national averages [Marion Merrell Dow (1994)].

Report Card Ratings

In general, 10-53 percent of the plans in each sample were rated superior on any of the five health plan performance measures developed by the firm. Variation differed by geographic region with plans in more established markets such as Boston performing better on average for these measures of plan performance. There is significant variation in all samples to allow for the statistical identification of the association between plan choice and plan performance ratings.

Market Characteristics

For samples a-f, which are based on unique plan/market combinations,[12] there are roughly 3 plans available in each market with some markets having as little as two MC plan choices and other markets having as many as eight. For active employees, there were between 131 and 190 employees per market with the equivalent range for retirees being 12-17. Some plans could be offered in multiple markets because markets were defined as unique plan/price combinations. The average plan available to active employees was offered in approximately two markets with 1-8 being the range. The equivalent numbers for retirees is about 4-8 markets per plan with a minimum of one and a maximum of 51. The larger numbers for retirees reflect the fact that markets with less than twenty employees were included in the retiree analyses allowing for more unique

[12] A market is defined as a unique combination of plans and prices. Therefore, according to this definition, two markets may contain the same set of plans, but be defined as different markets if at least one of the plans differs in price between markets.

plan/price combinations. In addition, the pooled retiree sample that combines Medicare and Non-Medicare eligible retirees increases the number of unique plan/price combinations that are available.

For the new hire and switcher samples (g and h respectively) there were 4-5 plans available per chooser with 2-7 being the range. Each plan in these samples was offered to anywhere from 1 to 414 employees.

Correlation between Variables

Tables 4-4a to 4-4h in Appendix A contain the correlation coefficients for all explanatory variables contained in the health plan choice models for all eight samples. In general, price is inversely correlated with the plan performance measures. This pattern of correlation was expected since the firm discounted the out-of-pocket price for plans with better performance ratings. This discount is not problematic for estimation since the relationship between the amount of the discount and the plan performance ratings is imperfect as evidenced by the fact that many of the correlation coefficients are not significantly different from zero at the p=0.10 level.[13]

The number of physicians per enrollee is, for the most part, inversely correlated with the health plan performance measures developed by the firm while the extent of integration between health plans and their physicians is generally positively correlated with the plan performance measures. Both of these findings are consistent with the hypothesis that more tightly controlled plans, which often employ smaller numbers of physicians, perform better on the plan performance measures because these plans are more stringent about restricting access to care.

The five health plan performance measures that were developed by the firm are generally positively correlated with each other. This is consistent with the hypothesis that plans that perform well on one domain of plan performance perform well on all domains of plan performance. The correlation between the explanatory variables was further examined by examining the R-squared from regressions of each explanatory variable on the others for the active non-union sample of employees selecting single

[13] The discount was based partly on the reported HEDIS measures, and partly on other variables such as plan premiums, cooperation with the firm's benefit managers, and the willingness to report data in a timely manner.

coverage. Two regressions, one with the medical treatment rating as the dependent variable, the other with the surgical care rating as the dependent variable, yielded R-squared values in excess of 0.30. Both of these regressions suggest that a significant portion of the variation in the medical treatment rating can be explained by the surgical care and physician quality ratings, all else constant.

Table 4-1a
1995 Sample Breakdown
From 1995 Enrollment Data Set

Total Eligible Enrollees		328,826			
- eligible employees and retirees	150,775				
- spouse	83,249				
- children	94,802				
Total Eligible Employees and Retirees		150,775			
- active employees	89,148				
- retirees	55,592				
- others	6,035				
Total Active Employees		89,148	**Total Retirees**		55,592
- Non-Union	47,178		- early retirees (< 65 years old)	27,134	
- Union	41,970		- Medicare eligible retirees (65 or older)	28,458	
Active Non-Union Employees		47,178	**Early Retirees**		27,134
- no coverage chosen	4,342		- no coverage chosen	3,365	
- single coverage chosen	12,566		- single coverage chosen	8,431	
- employee plus one coverage	10,922		- employee plus one coverage	13,357	
- family coverage chosen	19,348		- family coverage chosen	1,981	
Active Union Employees		41,970	**Medicare Eligible Retirees**		28,458
- no coverage chosen	732		- no coverage chosen	4,333	
- single coverage chosen	9,487		- single coverage chosen	12,299	
- employee plus one coverage	10,064		- employee plus one coverage	11,61E	
- family coverage chosen	21,687		- family coverage chosen	208	
Active Non-Union Single Coverage		12,566	**Early Retirees With Co. Coverage**		23,769
- MC coverage selected	[illegible]		- MC coverage selected	[illegible]	
- FFS coverage selected	5,260		- FFS coverage selected	16,636	
- other	1				
Active Union Single Coverage		9,487	**Medicare Retirees With Co. Coverage**		24,125
- MC coverage selected	[illegible]		- MC coverage selected	[illegible]	
- FFS coverage selected	2,686		- FFS coverage selected	22,937	
Active Non-Union Family Coverage		19,348	**Pooled Retirees With Co. Coverage**		47,894
- MC coverage selected	[illegible]		- MC coverage selected	[illegible]	
- FFS coverage selected	7,197		- FFS coverage selected	39,573	
- other	1				
Active Union Family Coverage		21,687			
- MC coverage selected	14,020				
- FFS coverage selected	7,667				

Table 4-1b
Sample Sizes for Health Plan Choice Analyses

Active Non-Union Employees		
	a. Single Coverage	5,795
	b. Family Coverage	10,198
Active Union Employees	c. Single Coverage	5,505
Retirees	d. Medicare Eligible	761
	e. Non-Medicare Eligible	4,559
	f. Pooled (Medicare and Non)	5,320
New Hires*	g. Single Coverage	294
Switchers to MC (1994-1995)*	h. Single Coverage	1,637

* denotes conditional logit only

Table 4-2
Health Plan Quality Domains and their Measures

Domain	Measures
Surgical Care	Cardiac Catheterizations per 1000 Members
	Coronary Artery Bypass Graft Surgeries per 1000 Members
	Cholecystectomy's per 1000 Members
	Hysterectomy's per 1000 Members
	Laminectomy's per 1000 Members
	Cesarean Section Rate per 100 Live Births
	General Hospital Acute Care Days per 1000 Members
Preventive Care	Childhood Immunization Rate
	Cholesterol Screening Rate: Ages 20-39
	Cholesterol Screening Rate: Ages 40-64
	Mammography Screening Rate: Women Ages 52-64
	Cervical Cancer Screening Rate: Women Ages 21-64
Employee Satisfaction	Overall Enrollee Satisfaction
	Percent of Primary Care Physicians Accepting New Patients
	Telephone Abandon Rate
	Waiting Time in Days for Non-Urgent Appointment
	Waiting Time in Hours for Urgent Appointment
Physician Quality	Percent of Primary Care Physicians That Are Board Certified
	Percent of Specialists That Are Board Certified
	Percent of Primary Care Physicians That Are Terminated
Medical Treatment	Diabetic Retinal Exam Rate
	Reporting on Four Clinical Management and Credentialing Measures

Table 4-3: Means and Standard Deviations

	Single Non-Union	Family Non-Union	Single Union	Medicare Retiree	Non-Medicare Retiree	Pooled Retiree	New Employees	Plan Switchers
Price ($ per month)	217.08	597.34	9.68	17.66	18.13	18.05	214.21	215.62
	(10.16)	(29.19)	(16.30)	(27.67)	(47.58)	(44.47)	(5.66)	(7.62)
Docs/Members	0.030	0.029	0.030	0.027	0.029	0.028	0.023	0.031
	(0.036)	(0.035)	(0.036)	(0.025)	(0.033)	(0.033)	(0.017)	(0.021)
Integration	0.31	0.31	0.32	0.33	0.33	0.33	0.33	0.25
	(0.46)	(0.46)	(0.47)	(0.47)	(0.47)	(0.47)	(0.24)	(0.19)
Prevention	0.29	0.29	0.24	0.46	0.39	0.40	0.18	0.21
	(0.45)	(0.46)	(0.43)	(0.50)	(0.49)	(0.49)	(0.25)	(0.26)
Satisfaction	0.16	0.17	0.20	0.33	0.20	0.22	0.10	0.13
	(0.37)	(0.38)	(0.40)	(0.47)	(0.40)	(0.42)	(0.17)	(0.16)
Medical Treatment	0.34	0.35	0.35	0.53	0.43	0.45	0.27	0.30
	(0.48)	(0.48)	(0.48)	(0.50)	(0.50)	(0.50)	(0.29)	(0.34)
Physician Quality	0.27	0.29	0.27	0.21	0.25	0.25	0.22	0.23
	(0.44)	(0.46)	(0.45)	(0.41)	(0.44)	(0.43)	(0.27)	(0.21)
Surgical Care	0.27	0.30	0.39	0.49	0.37	0.39	0.27	0.31
	(0.45)	(0.46)	(0.49)	(0.50)	(0.48)	(0.49)	(0.32)	(0.35)
Plans/Market	3.57	3.66	2.93	2.68	2.73	2.72	NA	NA
	(1.53)	(1.49)	(1.00)	(1.08)	(1.12)	(1.11)	NA	NA
Enrollees/Market	131.71	175.83	189.83	11.71	16.82	15.83	NA	NA
	(158.36)	(259.22)	(319.83)	(15.72)	(47.31)	(43.08)	NA	NA
Markets/Plan	1.78	2.23	1.67	4.243	6.85	8.39	NA	NA
	(1.11)	(1.77)	(1.78)	(4.68)	(7.74)	(10.28)	NA	NA
Plans/Chooser	NA	NA	NA	NA	NA	NA	3.77	4.64
							(1.60)	(1.51)
Choosers/Plan	NA	NA	NA	NA	NA	NA	14.21	86.32
							(15.17)	(117.93)
N	157	212	85	174	740	914	294	1637

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Chapter V
Econometric Methods

Empirical models of consumer choice are a direct extension of the neoclassical utility theory described in chapter II, with the underlying assumption of these models being that consumers are utility maximizers. Existing studies have typically modeled consumer choice of health plan from a discrete set of alternatives using logit models [Feldman et al. (1989), Short and Taylor (1989)]. This chapter defines the econometric models that will be used to estimate the probability of health plan enrollment as a function of the explanatory variables of interest. Conditional and nested logit models are discussed, as well as market share regression models using grouped data. Also discussed are issues related to heteroskedasticity, weighting, interaction terms and the treatment of outliers.

5.1 Notation

J = the universe of health plans contracting with the firm

Let $J_m \in J$ be the subset of health plans available in market 'm'

N_m = the number of choosers (employees or retirees) in market 'm'

p_{jm} = the price of plan j in market m

Note: By definition, two markets, q and r, may contain the same set of plans (i.e. $J_q = J_r$), but will be defined as different markets if $p_{jr} \neq p_{jq}$ for some same plan j.

5.2 Conditional and Nested Logit Models

Individual 'i's' utility for health plan 'j' in market 'm' can be expressed by the following function:[1]

(5-1) $U_{ijm} = U(X_j, \alpha_i, \gamma_j, \varepsilon_{ijm})$

where:

X_j = a vector of health plan characteristics (i.e., price, physicians/enrollees, integration, five health plan performance ratings)

[1] The utility function can also be written to include characteristics of the individual. Individual characteristics can be interacted with plan characteristics to gauge the importance of plan characteristics by type of individual.

α_i = individual specific unobserved preference variables

γ_j = plan specific unobserved variables

ξ_{ijm} = an i.i.d. error term

If individual 'i' chooses plan 'j' it is inferred that the utility associated with plan 'j' must exceed that of all other plans that person 'i' could have chosen. Mathematically, this notion of utility maximization can be expressed as follows:

Define $Y_{ij} = 1$ when individual 'i' chooses health plan 'j' and $Y_{ij} = 0$ otherwise,

(5-2) $Y_{ijm} = 1$ implies: $U_{ijm} > U_{ikm} \quad \forall \quad k \neq j$

If it is assumed that the relationship between utility and the attributes is linear, the probability that $Y_{ijm} = 1$ can be written as:

(5-3) $\text{Prob}(Y_{ijm} = 1) = \text{Prob}\,(\beta' X_j + \alpha_i + \gamma_j + \xi_{ijm} > \beta' X_k + \alpha_i + \gamma_k + \xi_{ikm}) \; \forall \; k \neq j$

$= \text{Prob}\,(\xi_{ijm} - \xi_{ikm} > \beta'(X_k - X_j) + \gamma_k - \gamma_j)$

In this model, the β's measure the average value individuals place on plan specific attributes (such as out-of-pocket price and quality), and the γ's measure the average value that individuals place on plan specific unobserved variables.

In the standard conditional logit model, McFadden (1973,1974) has shown that if $(\xi_{ijm}-\xi_{ikm})$ follows a Type I extreme value distribution, then the probability that individual 'i' chooses plan 'j' in market 'm' can be expressed as equation (5-4):

(5-4) $\text{Prob}(Y_{ijm} = 1) = e^{(\beta' X_{ij} + \gamma_j)} / \sum_{k \in J_m} e^{(\beta' X_{ik} + \gamma_k)}$

To account for the fact that eligible beneficiaries of the firm are offered different health plan choices (i.e., due to location of residence), the probability in (5-4) is re-written as (5-5) by defining a dummy variable C_{ik} such that:

$C_{ik} = 1$ if choice k is in person i's choice set

0 if choice k is not in person i's choice set

(5-5) $$\text{Prob}(Y_{ijm} = 1) = \frac{e^{\beta' X_j + \gamma_j}}{\sum_{k=1}^{J} C_{ik} e^{\beta X_k + \gamma_k}}$$

Equation (5-5) cannot be estimated because the γ_j's are not observed. If we assume that the γ_j's =0 then (5-5) reduces to (5-6) which can be estimated.

(5-6) $$\text{Prob}(Y_{ij} = 1) = \frac{e^{\beta' X_j}}{\sum_{k=1}^{J} C_{ik} e^{\beta X_k}}$$

There are several limitations with the conditional logit model in (5-6). First, the distribution of the ε's which underlies (5-6) assumes independence of irrelevant alternatives (IIA). IIA implies that the probability of choosing a given plan relative to another plan is independent of the other plans in the chooser's choice set. If some plans are closer substitutes to a given plan than others, IIA will be violated. Following Feldman et al. (1989), this limitation is addressed by full information maximum likelihood (FIML) estimation of a nested logit model, where the nests are defined by the extent of plan/physician integration. The nested logit model includes a coefficient estimate for the 'inclusive value.' The inclusive value parameter is assumed to fall between zero and one, with one minus the inclusive value being a measure of the correlation of unobserved utility within a given nest. Hence, the parameter estimate for the inclusive value will yield an indication of how well the data fit the imposed nesting scheme [Train (1986)].

If γ_j's $\neq$ 0 then the distributional assumptions of (5-6) are violated and these unobserved variables remain in the error term. Since unobserved plan specific variables are common to each choice alternative across choosers, the ε's will be correlated across individual observations and therefore will not be independently and identically distributed. This violation of the independence assumption of the conditional logit model results in a downward bias in the estimated standard errors because the model assumes more independence in the observations than actually exists. This bias is an important limitation of the conditional logit model since it influences the inferences obtained from the data, possibly leading to erroneous conclusions about the strength of the relationship between the explanatory variables and the probability of plan enrollment.

5.3 Market Share Regression Model

The violation of the independence assumption in the conditional logit model is addressed by an alternative estimation approach which relies on plan market shares and mathematically approximates the conditional logit model. Plan market shares are defined by equation (5-7). The estimated probability that plan 'j' will be chosen (P_{jm}) is identical for all individuals (individual characteristics do not influence this probability), therefore the observed share (5-7) will converge to this probability as the number of choosers approaches infinity. In smaller samples, the observed share will equal the probability plus an error term (v_{jm}), which represents the deviation between the share and the probability as shown in equation (5-8).[2]

(5-7) $S_{jm} = \sum_{i=1..N_m} Y_{ijm} / N_m$

(5-8) $S_{jm} = (e^{(\beta' X_j + \gamma_j)} / \sum_{k=1..J_m} c_{ik}\, e^{(\beta' X_k + \gamma_k)}) + v_{jm}$

The ratio of shares for plans j and h can be written as (5-9). Taking the logarithm of (5-9) results in equation (5-10)

(5-9) $S_{jm} / S_{hm} = [(e^{(\beta' X_j + \gamma_j)} / \sum_{k=1..J_m} c_{ik}\, e^{(\beta' X_k + \gamma_k)}) + v_{jm}\,] /$
$[(e^{(\beta' X_h + \gamma_h} / \sum_{k=1..J_m} c_{ik}\, e^{(\beta' X_k + \gamma_k)}) + v_{hm}\,]$

(5-10) $\log (S_{jm} / S_{hm}) = \log [e^{(\beta' X_j + \gamma_j)} + v_{jm} * \sum_{k=1..J_m} c_{ik}\, e^{(\beta' X_k + \gamma_k)}\,] -$
$\log [e^{(\beta' X_h + \gamma_h)} + v_{hm} * \sum_{k=1..J_m} c_{ik}\, e^{(\beta' X_k + \gamma_k)}\,]$

Equation (5-10) can be transformed into a more simple form by taking first order Taylor series approximations around $v_{jm} = 0$ and $v_{hm} = 0$. This yields (5-11) which is approximately equal to (5-10).

(5-11) $\log (S_{jm} / S_{hm}) \cong \log (e^{(\beta' X_j + \gamma_j)}) - \log (e^{(\beta' X_h + \gamma_h)}) + [D/(e^{(\beta' X_j + \gamma_j)})] * v_{jm} -$
$[D/(e^{(\beta' X_h + \gamma_h)}] * v_{hm}$
$= \beta(X_j - X_h) + (\gamma_{jm} - \gamma_{hm}) + [D/(e^{(\beta' X_j + \gamma_j)})] * v_{jm} -$
$[D/(e^{(\beta' X_h + \gamma_h)})] * v_{hm}$

[2] A simple example illustrates why the probability and share are not identical. In the case of a fair coin, the probability of obtaining a 'head' or 'tail' on any flip of the coin is 0.5 for each possible outcome. However, the 'share' or proportion of either outcome (i.e. 'heads' or 'tails') relative to the total number of coin flips (N) will not necessarily be identical to the probability (0.5), although it will approach the probability as $N \to \infty$.

where $D = \sum_{k=1..Jm} c_{ik}\, e^{(\beta' X_k + \gamma_k)}$

$= \beta(\Delta X) + \Delta\gamma + v_{jm}/P_{jm} + v_{hm}/P_{hm}$

Regression Analysis

In order to identify the share regression model using ordinary least squares regression analysis, the dependent and explanatory variables are defined as deviations from an arbitrarily chosen reference plan in each market. Hence, the model which will be estimated is:

(5-12) $\log(S_{jm}) - \log(S_{j^*m}) = \beta(X_j - X_{j^*}) + (\gamma_{jm} - \gamma_{j^*m}) + (v_{jm}/P_{jm} - v_{j^*m}/P_{jm})$

where:

S_{jm} = the market share of plan 'j' in market 'm'

S_{j^*m} = the market share of an arbitrarily chosen reference plan in market 'm'.

v_{jm} = a stochastic error which will be a function of market size and the probabilities that plan 'j' and the reference plan are chosen.

With a reference plan in each market, there will be (n-1) observations in each market (where n is equal to the total number of plans in a market) and the number of observations in the OLS regression (N) will equal the total number of plans minus the number of markets.

The model described in equation (5-12) differs from that described in equation (5-6) for several reasons. First, the functional form in equation (5-12) is only an approximation to that which one would get if the micro data were aggregated to the plan level due to the Taylor series approximation. Moreover, the model in equation (5-12) assumes the plan specific unobservables (γ's) are distributed normally with a mean of zero, whereas the model in equation (5-6) assumes the γ's $= 0$.

5.4 Heteroskedasticity

The error term in equation (5-12) is heteroskedastic because markets differ in size and plans differ in the probability that they will be chosen. Additionally, within the same market, the unobserved component of (5-12) will be correlated across observations because they share the same reference plan. Moreover, because several plans are offered in multiple markets, a correlation in the unobserved component of (5-12) will exist

between these observations as well. The magnitude of (and potential problem with) the latter correlations will depend on the number of markets for which these commonalities exist. To gauge the magnitude of the correlation of unobserved variables across observations, the cross product of the residuals for plans that are in the same market (i.e., share a common reference plan), different markets with common plans, and different markets but common reference plans, can be examined. A t-test can be conducted for the null hypothesis that the mean of the cross-products of the residuals is equal to zero.

5.5 Zero Shares

Another complication for the estimation of (5-12) arises because some plans have zero shares. This is more common in markets with less choosers, although it can also occur in markets with large numbers of choosers. The presence of zero shares is important because Garnick et al. (1989) have demonstrated that share regressions are much less stable when they are subject to the 'zero flow problem.' Plans with zero shares are excluded from this analysis under the assumption that they are not truly in the choice set since no employee or retiree has chosen these plans. This assumption eliminates concerns that arise due to zero flows.[3] Dropping irrelevant alternatives does not impact the estimates of the logit models.

5.6 Weighting

Even when zero shares are excluded from the analysis, it is not clear how smaller markets should be valued relative to larger markets when estimating (5-12). This is essentially a question of whether or not identical market shares should be valued similarly in large and small markets. It is likely that shares from larger markets should receive more weight in the estimation of (5-12) since the share is based on more observations. However, since the exact weight that each observation receives depends on the complex form of the variance-covariance matrix, it is not clear what the appropriate weight should be. The analysis in this dissertation estimates a non-weighted version of

[3] This assumption is less realistic for smaller markets. For example, if a plan was not chosen in a market with a large number of choosers (i.e. 1,000 employees), it is reasonable to assume that even though the plan was offered, it was not considered a realistic choice by most choosers. However, in a small market (e.g. 3

equation (5-12), and a version weighted by the square root of the market size. The standard errors reported in the unweighted case are robust to heteroskedasticity. The non-retiree models are estimated only with markets that contain at least 20 choosers while the retiree models are estimated regardless of the number of choosers due to sample size concerns.

5.7 Interaction Terms

It is reasonable to believe that individual characteristics may influence the manner in which different health plans are valued (i.e. individuals of different ages may differentially value unrestricted choice of physician). These hypotheses can be easily explored in the conditional logit model by interacting individual specific variables with the underlying variables in the model. However, when individual specific interactions are included, estimation of the share equations becomes difficult since estimation of differentials due to individual characteristics necessitates defining shares for each distinct permutation of chooser characteristics (i.e. each possible age). When chooser characteristics are continuous, the problem of zero flows [Garnick et al. (1989)] will frequently arise. Because of this difficulty, many authors resort to estimation of logit models which easily allow for interactions between plan and chooser characteristics. However, if plan specific unobserved variables are important, this approach will overestimate the precision of the estimates in the same manner as the logit models which include only plan specific attributes. The pooled retiree sample that is estimated in this dissertation includes a specification in which price is interacted with a Medicare dummy variable, and a specification that is fully interacted with the Medicare dummy. These interactions indicate whether Medicare eligible retirees differ from non-Medicare eligible retirees in their sensitivity to various health plan attributes.

5.8 Outlier Plans

An advantage of the share regression approach is that it easily allows for the examination of outlier plans. Outliers can be examined visually via partial regression

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employees) it is not clear whether the plan was not chosen because it was not considered a realistic choice, or because it was a realistic but sub-optimal choice for the employees in the market.

plots or can be formally identified based on the value of the studentized residual. The studentized residual is defined for each observation as a function of the difference between the predicted value from the full model versus that from a model omitting that observation. In this dissertation outliers are defined as observations with studentized residuals that are greater than 2 in absolute value. The regression models are re-estimated omitting the identified outlier plans [Belsey, Kuh, and Welsch (1980)].

5.9 Reported Results

The coefficient and standard error estimates from all models (the conditional choice model, nested logit model, and the weighted and unweighted share regression models) are reported as well as the odds ratios that are derived from the coefficients. Odds ratios indicate how the probability of choosing a health plan differs between two plans that are exactly identical on all characteristics except for the characteristic in question. For the continuous variables, the odds ratios are estimated by comparing a plan with the mean value of the variable in question relative to a plan with a value that is one standard deviation above the mean (and $5 per month above the mean value for price). For the discrete variables, the odds ratios are estimated by comparing a plan rated 'superior' on the plan rating in question relative to an otherwise identical plan that did not receive the 'superior' rating.

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Chapter VI
Results

The parameter estimates and p-values for all models and all samples are reported in Tables 6-1a to 6-8a at the end of this chapter. The corresponding odds ratios are found in Tables 6-1b to 6-8b in Appendix B. Tables 6-1c to 6-3c in Appendix B contain the share regression coefficients for active employees (non-union and union) choosing single and family coverage when outliers are excluded. The corresponding odds ratios are contained in Tables 6-1d to 6-3d in Appendix B. Three sets of basic results are reported for the pooled retiree sample and are contained in Appendix B. First, estimates and odds ratios from a model where price is interacted with a Medicare dummy variable are reported in Tables 6-6a and 6-6b. Second, estimates and odds ratios from a model where all explanatory variables are fully interacted with the Medicare dummy variable are reported in Tables 6-6c and 6-6d. Third, regression coefficients and odds ratios for the pooled retiree sample excluding outliers are reported in Tables 6-6e and 6-6f.

6.1 Results by Sample

This section describes the results obtained for the eight samples that are analyzed in this dissertation. The results from a base sample (active non-union employees choosing single coverage) are described in detail, and the results from the remaining samples are described relative to this base sample, with particular emphasis placed on differences from the base sample results.

Base Sample: Active Non-Union Employees Choosing Single Coverage

The results indicate that the relationship between plan enrollment and the health plan ratings is mixed. Medical treatment is the only rating that is estimated to be positively related to plan enrollment in all four models. However, the estimate is only statistically significant in the two logit models. The preventive care rating is positively related to plan enrollment in all models except the conditional logit, but statistically significant only for the two share regression models. The odds ratios computed from the

preventive care estimates in the share regression models imply that non-union employees choosing single coverage are between 74% and 108% more likely to enroll in a plan that received a superior rating on this dimension.

Employee satisfaction, estimated as inversely related to plan choice for all four models, was the most robust finding for the health plan ratings. The estimates for this variable are statistically significant at the 0.01 level for all four statistical models and the odds ratios suggest that employees are between 32 and 68 percent less likely to enroll in plans that were rated superior on this dimension.

The inverse relationship between the employee satisfaction rating and enrollment appears counter-intuitive, but upon further examination of the measures that comprise this index, may actually be quite rational. For example, the satisfaction domain contains two appointment waiting time measures (for urgent and non-urgent care) and a measure indicating the percentage of physicians in the health plan that were accepting new patients. In determining the report card ratings, the firm's methodology assumed that longer waiting times and fewer physicians accepting new patients were negative characteristics.

However, it is plausible that plans with longer appointment waiting times and less physicians accepting new patients are plans with popular physicians, in which case these measures may actually proxy for physician popularity and physician quality rather than positively measuring satisfaction. An additional explanation for the apparent counterintuitive finding concerns the measure of overall enrollee satisfaction with the health plan, one of five measures comprising the employee satisfaction index. HEDIS 2.0 did not require a standardized satisfaction survey but simply required plans to administer their own satisfaction survey and to report an overall satisfaction rate. Anecdotal evidence from the benefits managers at the firm suggests that some of the 'better' plans reported lower than average overall satisfaction ratings, apparently because their methodology for measuring overall satisfaction was more rigorous than most plans.

The results for the physician quality and surgical care ratings are mixed. For both of these variables, the logit models yield positive estimates while the share regressions suggest an inverse relationship between enrollment and these ratings. The physician quality rating is only significant at the p=0.05 level in the conditional logit model , while

none of the surgical care estimates are significantly different from zero at the p=0.05 level. Interestingly, like the employee satisfaction rating, the surgical care rating may also suffer from poor assumptions about the relationship between the rating and the measures that comprise the index. For example, the firm assumed that plans performing more surgeries were 'worse', despite the fact that the underlying HEDIS surgical care measures were not adjusted for case-mix severity. Moreover, it may be the case that plans performing a greater number of surgeries may be more attractive to employees if these plans generally place fewer restrictions on access and utilization. If this hypothesis is true, then the surgical rates would be positively correlated with other plan characteristics that employees and retirees value, but the methodology used by the firm to construct the ratings would not have captured this.

The estimates for the price variable support the findings from other studies and confirm what economic theory predicts; namely that plan enrollment is inversely related to out-of-pocket price. The logit coefficients are the only estimates to achieve statistical significance. The odds ratios suggest that employees are between six and ten percent less likely to choose a plan with a monthly out-of-pocket price that is five dollars above the mean ($222), relative to an otherwise identical plan with the mean price ($217).

As predicted, employees are attracted to plans with a large number of physicians, but only the estimates from the unweighted share regression and conditional logit models are statistically significant at the p=0.10 level. The odds ratios derived from the estimates imply that employees are between 3 and 20 percent more likely to enroll in a plan with a ratio of physicians/enrollees that is one standard deviation above the mean (0.660) relative to an otherwise identical plan that with the mean value (0.30).

Finally, estimates for the integration variable are mixed. The logit models suggest an inverse relationship between enrollment and integration while the share equations suggest a positive relationship. Only the coefficient from the nested logit model is statistically significant however. The integration variable is designed to capture the relationship between the provider panel and the insurance plan. For example, staff and group model HMOs are considered 'integrated' because of the close relationship between the plan's physician panel and the insurance mechanism. The mixed results for the

integration variable may reflect the difficulty of categorizing health plans in today's marketplace.

When the share regression models are re-estimated omitting seven outliers, the price and physicians/enrollees coefficients obtain statistical significance and the adjusted R-squared improves for both models.[1] The odds ratios from the models which exclude outliers are qualitatively similar to the full model for most variables, but suggest a stronger response for price, physicians/enrollees, and integration relative to the models which include the outlier plans.

Active Non-Union Employees Choosing Family Coverage

Active non-union employees choosing family coverage were generally less sensitive to price than the base sample. For example, employees were between 2-6 percent less likely to enroll in a plan with a monthly price that was five dollars above the mean ($602) relative to an otherwise identical plan with the mean price ($597). This finding is consistent with the hypothesis that families are less price sensitive than single individuals because employees choosing family coverage are older (mean age of 40.2 v. 36.2) and have more dependents (mean number of dependents 2.93 v. 0.07) with a wider array of health care needs.

For preventive care, the enrollment patterns for employees choosing family coverage were more strongly related to this rating than for the base sample, and the estimates were statistically significant in all four models. Because the prevention index contains measures that are generally applicable to children and older adult populations (i.e. childhood immunization rates and cancer screenings), one might expect this rating to be more salient to families relative to single employees who are younger and have less dependents.

Like the base sample, the results for the satisfaction rating also suggest an inverse relationship between the rating and plan enrollment, however the odds ratios imply a much smaller impact. For example, employees choosing family coverage were anywhere

[1] Outliers were identified based on the value of the studentized residual, defined for each observation as a function of the difference between the predicted value from the full model versus that from a model omitting that observation. Outliers are defined as observations with a studentized residual >2 in absolute value [Belsey, Kuh, and Welsch (1980)].

from less than one percent less likely to as much as 58 percent less likely to enroll in a plan that received a superior rating on satisfaction. Finally, relative to the base sample, employees choosing family coverage were generally less likely to enroll in plans receiving a superior rating on both physician quality and surgical care, and these results were more significant relative to the base sample.

Active Union Employees Choosing Single Coverage

The results for this sample should be interpreted cautiously because even though the sample contains a similar number of employees in the logit models (5,505 relative to 5,795 in the base sample), these employees are clustered in a smaller number of plans and markets (i.e. N=56 relative to N=113 in the base sample share regressions). With eight regressors, there clearly are concerns about the validity of the estimates obtained from the share regression models.

Nonetheless, the enrollment of union employees choosing single coverage is less influenced by price than their non-union counterparts. The odds ratios imply that union employees are between 30-49 percent less likely to enroll in a plan with a price that is $5 above the mean ($14.68) relative to an otherwise identical plan with the mean price ($9.68). This greater response to price may be due to the fact that union employees at this firm have traditionally faced very low or even zero out-of-pocket prices as evidenced by the descriptive statistics in Table 4-3.

The results for the report card ratings are puzzling for this sample. In general there is not much difference from the base sample for the preventive care and satisfaction ratings. However, the results for the medical treatment, physician quality, and surgical care ratings are much different than the base sample for reasons that seem inexplicable. For example, union employees choosing single coverage are much more likely to enroll in plans receiving superior ratings on physician quality and surgical care. These results are very strong and significant for all models for the physician quality rating. The surgical care rating achieves statistical significance for the logit models only. For medical treatment, employees are less likely to enroll in plans rated superior on this dimension, which is entirely different from the results for the non-union sample. There is no obvious reason as to why union and non-union employees choosing single coverage

should deviate so much in terms of the relationship of their enrollment patterns to these plan ratings. The strange results obtained in this sample may be due to the small sample size in the share regression models, although the logit models, which do not suffer from sample size problems, also yield similar qualitative results.

Finally, employees in this sample are less likely to enroll in plans with more physicians and plans with tightly integrated physician panels. These results are particularly interesting since tightly integrated plans typically have smaller physician panels [Marion Merrell Dow, (1994)].

Non-Medicare Eligible Retirees

Relative to the base sample, non-Medicare eligible retirees are less influenced by price changes. The odds ratios suggest that retirees are only 2-5 percent less likely to enroll in plans with a monthly out-of-pocket price that is five dollars above the mean ($23.13) relative to an identical plan with the mean price ($18.13). The retirees in this sample are also more likely to enroll in plans receiving superior physician quality and surgical care ratings relative to the base sample. For both variables the results are positive across all methods. The results are statistically significant for all models for the physician quality rating and for three of four models for the surgical care rating.

Unlike the base sample, retirees are less likely to enroll in plans rated superior on medical treatment. The results were significant for all models and suggest that retirees are between 23-35% less likely to enroll in plans with superior ratings. This result is interesting given that the medical treatment rating is arguably the weakest of the five since it only contains the diabetic retinal examination rate and indicators of whether or not the plan queries physician credentials, including hospital privileges, state licensure, and malpractice suits.

Medicare Eligible Retirees

The odds ratios for the price variable suggest that Medicare retirees are between 7-11 percent less likely to enroll in plans that are $5 per month more expensive ($22.66) than otherwise identical plans with the mean price ($17.66).

Relative to the base sample, Medicare retirees are less likely (6-8 percent) to enroll in plans with a larger number of physicians/enrollees. Only the estimate from the conditional logit model is statistically significant however. Medicare retirees are also between 39-55 percent less likely to enroll in a plan coded as 'integrated' relative to an otherwise identical non-integrated plan.

The results for the preventive care rating are mixed, exhibiting a positive and significant relationship in the share regression models and a negative and significant relationship in the logit models. The differences across models may be due to the fact that unlike the base sample, markets with less than 20 choosers (Medicare eligible retirees) were included. The inclusion of these markets in the share regression equations was necessary because there were few markets with more than 20 retirees. However, their inclusion raises concerns about the validity of the proportions used in the share regressions, which may explain differences in the estimates obtained across methods.

Finally, the physician quality and surgical care ratings are positively and significantly related to plan enrollment for all four models. The stronger findings for the physician quality rating relative to the base sample are difficult to explain. Perhaps retirees simply took this rating at face value. Retirees may also have taken the surgical care rating at face value and the stronger findings may be due to the fact that the Medicare population is much more likely to need surgical care relative to younger active employees. However, plans that received 'superior' ratings were plans that performed less surgeries, as opposed to plans that were necessarily better in the quality of the surgeries performed. Therefore, it would be valuable to know if retirees understood the construction of the rating and whether they agreed with the values imposed by the firm.

Pooled Retirees with Medicare Interaction

The coefficients on the explanatory variables interacted with a Medicare dummy variable indicate the estimated differences in the relationship between health plan enrollment and the explanatory variables for the Medicare and non-Medicare samples. In the fully interacted model, there are three differences that are statistically significant. First, although all retirees are attracted to plans with lower out-of-pocket prices, Medicare retirees are more price sensitive.

Enrollment for both Medicare and non-Medicare retirees is positively related to the preventive care rating, but the effect of the preventive care rating is less for the Medicare sample relative to the non-Medicare sample. The interaction is only significant in the two logit models however. Finally, enrollment is inversely related to the satisfaction rating for all retirees. However, enrollment is more negatively related to the satisfaction rating for Medicare retirees relative to their non-Medicare counterparts. The estimated interaction for the satisfaction rating is significant in all models except the weighted share regression model.

New Hires

Because there were a small number of new hires in 1995 (N=294), only the conditional logit model could be estimated for this sample. The estimates from this model suggest that only the price variable is statistically significant and quantitatively different from the base sample. Specifically, plan enrollment for the new hire sample is also inversely related to price, but the response is slightly stronger for this sample. The odds ratio implies that new hires are 13 percent less likely to enroll in a plan with a monthly price that is $5 above the mean ($219) relative to an otherwise identical plan with the mean price ($214).

Several other variables yield estimates that are qualitatively different from the base model. However, these estimates are not statistically significant. For example new hires are less likely to enroll in plans with larger physician panels, and plans that received superior ratings on preventive care, physician quality, and surgical care.

Despite the small sample size, these results are interesting because it is commonly hypothesized that new hires are likely to be more responsive to all variables because, unlike the base sample, they are actively making a choice for the first time. The estimates obtained from this sample do not provide evidence to support this hypothesis.

1994-1995 Plan Switchers

Like the new hire sample, only the conditional logit model was estimated for the plan switcher sample because of small sample size. Unlike the new hire sample however, the estimates from the plan switcher sample are generally statistically significant. The

results suggest that plan switchers are less likely to enroll in plans with larger physician panels and plans that are tightly integrated. This pattern is evident in several of the samples and begs the question of what is attractive about, or what is unobserved and correlated with, plans that have fewer physicians and that are not integrated.

The results from this sample also suggest that switchers are less likely to enroll in plans rated superior on preventive care, physician quality, and surgical care. Plan switchers are highly likely to enroll in plans rated superior on medical treatment, which is inexplicable given the measures that comprise this index. Finally, unlike all other samples and models, plan switchers are more likely to enroll in plans rated superior on satisfaction. The odds ratio implies that switchers are 14 percent more likely to enroll in a plan rated superior on employee satisfaction relative to an otherwise identical plan that did not receive the superior designation. Given the robustness of the estimates for the satisfaction rating across all other samples, this result should be interpreted cautiously.

6.2 Differences in Sample Response by Variable:

Tables 6-9a to 6-9h in Appendix B summarize the odds ratios and p-values for all samples and all models (a total of 26) for each variable.[2]

6.3 Results With Outliers Omitted

Influential observations (outliers) were identified for the share regression models. Outliers were identified by the value of the studentized residual, which is defined for each observation as a function of the difference between the predicted value from the model with all observations included relative to a model which omits outliers. Specifically, outliers were defined as observations with a studentized residual larger than two in absolute value [Belsey, Kuh, and Welsch, (1980)]. Estimates and p-values are reported in Tables 6-1c to 6-3c, and Table 6-6e in Appendix B. The corresponding odds ratios are reported in Tables 6-1d to 6-3d, and Table 6-6f in Appendix B.

[2] The 26 models that are estimated include six samples (non-union single and family coverage, union single coverage, Medicare eligible retirees, non-Medicare eligible retirees, pooled retiree sample) with four models each (weighted and unweighted share regressions and conditional and nested logit models). In addition, conditional logit models only (due to sample size) are estimated for two samples (new employees and managed care plan switchers).

In all cases, the adjusted R-squared improves when the model is estimated with the outlier plans excluded. In addition, estimates of the impact of price and physicians/enrollees becomes statistically significant in the non-union single coverage sample, and the odds ratio for price becomes smaller, indicating that the magnitude of the price coefficient became more negative when outlier plans were omitted. The odds ratio for physicians/enrollees increases indicating that the positive relationship between this variable and plan enrollment is stronger when outlier plans are excluded from the model.

Exclusion of outliers does not always yield predictable changes as estimates from the sample of non-union employees choosing family coverage illustrates. When seven outlier plans are dropped in this sample, the estimate for price becomes less statistically significant (p-value increases from 0.1072 to 0.2676 in the unweighted share regression model) as does the estimate for satisfaction (p-value increases from 0.1563 to 0.3430 in the unweighted share regression model). For this sample, the estimate for integration achieves statistical significance in the weighted share regression when the outlier plans are dropped, and the odds ratio increases.

6.4 Inclusive Value Estimates From Nested Logit Models

In the nested logit model, one minus the coefficient on the inclusive value estimates the correlation among the error terms within each nest. If the parameter estimate is 1.0, then the correlation among the errors within a nest is zero, and the nested logit model is equivalent to the conditional logit model [Train, (1986)]. In this study two nests are defined for each sample, based on whether the physicians in the managed care plan are tightly integrated with the plan's insurance component. The correlation between the error terms in each nest, which are based on the parameter estimates from the conditional logit model, suggest that the error terms within nests are negatively correlated except for the integrated nest in the non-union family sample. The implied correlation between error terms in this sample is 0.267. For the non-integrated nest, the range of correlation coefficients across samples is –0.854 to –0.057. The range for the integrated nest is –1.37 to 0.267. Since one would expect the error terms of plans within a nest to be positively correlated, it appears that from an empirical perspective, nesting based on

integration is not appropriate. This illustrates the difficulty of classifying health plans in today's complex and changing health care marketplace.

6.5 Statistical Significance

In chapter V it was hypothesized that the standard error estimates from the conditional logit model would be biased downward if the assumption of independence of observations is violated. It is likely that this assumption is violated in this study since the sample contains individuals who chose health plans from the same set of options. The hypothesis can be empirically examined by comparing the standard error estimates and p-values from the two share regression models with those from the conditional logit model. As Tables 6-9a to 6-9h illustrate, this hypothesis seems validated for most variables with the exception of preventive care. For preventive care, the p-values for both single coverage samples (union and non-union) are larger for the conditional logit and nested logit models than for the estimates from the share equations. For the non-union family coverage sample, the p-value from the conditional logit model is relatively larger than the estimates obtained from the two share regression equations. For the satisfaction and surgical care variables, the hypothesis is validated in all samples except the sample of non-union employees choosing family coverage.

6.6 Goodness of Fit

For each of the share regression equations, the hypothesis that none of the report card ratings enter the model can be rejected at the $p=0.01$ level with the exception of the sample of union employees choosing single coverage, which can be rejected at the $p=0.05$ level. The adjusted R-squared values indicate that on average, about 15-40% of the variation in plan choice is explained by the model. The majority of this variation is probably explained by price alone.

Table 6-1a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(active non-union employees choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0166 (0.2934)	-0.0213 (0.1909)	-0.0123 (<0.0001)	-0.0114 (<0.0001)
Docs/Members	4.9564 (0.0686)	3.8573 (0.2685)	3.0001 (<0.0001)	0.9111 (0.1443)
Integration	0.1033 (0.6353)	0.2000 (0.4125)	-0.0282 (0.4933)	-0.0878 (0.0182)
Prevention	0.5526 (0.0002)	0.7310 (0.0001)	-0.0123 (0.8239)	0.0224 (0.6830)
Satisfaction	-0.8144 (0.0031)	-1.1301 (0.0001)	-0.3814 (<0.0001)	-0.4122 (<0.0001)
Medical Treatment	0.0712 (0.8222)	0.0910 (0.7912)	0.4293 (<0.0001)	0.3817 (<0.0001)
Physician Quality	-0.0122 (0.9580)	-0.1745 (0.4347)	0.1424 (0.0014)	0.0726 (0.0844)
Surgical Care	-0.2813 (0.4546)	-0.2734 (0.4585)	0.1074 (0.0769)	0.07415 (0.2077)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.4305* (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	1.1875* (0.0688)
N	113	113	5795	5795
Adjusted R^2	0.1939	0.3827		
Log Likelihood			-7985.526	-7901.926

* p value based on the null hypothesis that the coefficient = 1

Table 6-2a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(active non-union employees choosing family coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0096 (0.1072)	-0.0119 (0.0158)	-0.0062 (<0.0001)	-0.0033 (<0.0001)
Docs/Members	2.3039 (0.4426)	2.9755 (0.3484)	3.8131 (<0.0001)	5.1735 (<0.0001)
Integration	0.1014 (0.6515)	0.0837 (0.6972)	-0.0168 (0.5682)	0.1617 (<0.0001)
Prevention	0.6391 (<0.0001)	0.8062 (0.0001)	0.0980 (0.0242)	0.2308 (<0.0001)
Satisfaction	-0.3708 (0.1563)	-0.8777 (0.0001)	-0.1039 (0.0062)	-0.0044 (0.9081)
Medical Treatment	0.0891 (0.7580)	0.1687 (0.6043)	0.2493 (<0.0001)	0.3491 (<0.0001)
Physician Quality	-0.2532 (0.2735)	-0.5573 (0.0062)	-0.1837 (<0.0001)	-0.1375 (0.0002)
Surgical Care	-0.5839 (0.0888)	-0.4748 (0.1607)	0.1348 (0.0063)	-0.0379 (0.3755)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.2887 (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	-0.7341 (0.0022)
N	154	154	10,198	10,198
Adjusted R^2	0.1563	0.3843		
Log Likelihood			-14190.38	-13971.55

* p value based on the null hypothesis that the coefficient = 1

Table 6-3a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(active union employees choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0308 (0.3109)	-0.0442 (0.1113)	-0.0221 (<0.0001)	-0.0241 (<0.0001)
Docs/Members	-1.4176 (0.8806)	-1.7368 (0.8098)	-4.3781 (<0.0001)	-4.6521 (<0.0001)
Integration	-0.9703 (0.0057)	-1.1821 (0.0055)	-0.8771 (<0.0001)	-0.8141 (<0.0001)
Prevention	0.2035 (0.6222)	0.3922 (0.2749)	0.0729 (0.9327)	-0.0238 (0.7682)
Satisfaction	-1.0848 (0.0012)	-1.0684 (0.0165)	-0.7185 (<0.0001)	-0.6565 (<0.0001)
Medical Treatment	-0.0773 (0.9023)	-0.3319 (0.6565)	-0.7486 (<0.0001)	-0.7420 (<0.0001)
Physician Quality	1.0762 (0.0107)	1.3383 (0.0057)	0.9406 (<0.0001)	0.9436 (<0.0001)
Surgical Care	0.8799 (0.1940)	1.2062 (0.1697)	1.2338 (<0.0001)	1.1204 (<0.0001)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.5504 (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	1.3863 (<0.0001)
N	56	56	5505	5505
Adjusted R^2	0.188	0.2783		
Log Likelihood			-6568.833	-6545.798

* p value based on the null hypothesis that the coefficient = 1

Table 6-4a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Medicare eligible retirees choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0150 (0.0052)	-0.0226 (0.0001)	-0.0182 (<0.0001)	-0.0154 (0.0003)
Docs/Members	-2.8878 (0.1403)	-3.2458 (0.1623)	-2.9490 (0.0325)	-2.2927 (0.1054)
Integration	-0.2708 (0.1096)	-0.3221 (0.1805)	-0.4906 (0.0636)	-0.7893 (0.0003)
Prevention	0.2592 (0.0860)	0.3581 (0.0487)	-0.5417 (0.0173)	-0.6207 (0.0059)
Satisfaction	-0.4874 (0.0041)	-0.7495 (0.0004)	-0.6019 (<0.0001)	-0.7482 (<0.0001)
Medical Treatment	-0.5674 (0.0051)	-0.7617 (0.0104)	-0.3335 (0.0795)	-0.1896 (0.2778)
Physician Quality	0.3722 (0.0450)	0.5886 (0.0067)	0.4147 (0.0071)	0.3844 (0.0051)
Surgical Care	0.3372 (0.2193)	0.4198 (0.2222)	0.7337 (0.0274)	1.0002 (0.0015)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.7713 (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	2.3661 (<0.0001)
N	109	109	761	761
Adjusted R^2	0.1728	0.3561		
Log Likelihood			-846.574	-833.614

* p value based on the null hypothesis that the coefficient = 1

Table 6-5a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Non-Medicare retirees choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0042 (0.0036)	-0.0045 (0.0826)	-0.0097 (<0.0001)	-0.0057 (0.0081)
Docs/Members	-1.9648 (0.1778)	0.3982 (0.8166)	-0.5247 (0.4833)	-1.9228 (0.0051)
Integration	-0.0877 (0.3237)	-0.0961 (0.3612)	-0.3274 (<0.0001)	-0.4206 (<0.0001)
Prevention	0.2599 (<0.0001)	0.4184 (0.0001)	0.4233 (<0.0001)	0.4703 (<0.0001)
Satisfaction	-0.0740 (0.4648)	-0.4254 (0.0003)	-0.1854 (0.0017)	-0.2827 (0.0001)
Medical Treatment	-0.2632 (0.0405)	-0.3005 (0.0584)	-0.4385 (<0.0001)	-0.3726 (<0.0001)
Physician Quality	0.2492 (0.0081)	0.3878 (0.0003)	0.4375 (<0.0001)	0.3919 (<0.0001)
Surgical Care	0.1684 (0.2272)	0.3418 (0.0521)	0.4073 (<0.0001)	0.4376 (<0.0001)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.7990 (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	1.0160 (<0.0001)
N	469	469	4559	4559
Adjusted R^2	0.053	0.1001		
Log Likelihood			-5902.410	-5705.582

* p value based on the null hypothesis that the coefficient = 1

Table 6-6a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Pooled retiree sample choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.0041 (0.0045)	-0.0046 (0.0707)	-0.0092 (<0.0001)	-0.0055 (0.0089)
Docs/Members	-2.2398 (0.0605)	-0.7281 (0.6044)	-1.8085 (0.0048)	-2.4871 (<0.0001)
Integration	-0.1168 (0.1386)	-0.1283 (0.1788)	-0.3301 (<0.0001)	-0.4059 (<0.0001)
Prevention	0.257669 (<0.0001)	0.406232 (0.0001)	0.2160 (0.0002)	0.2860 (<0.0001)
Satisfaction	-0.1748 (0.0488)	-0.4964 (0.0001)	-0.3382 (<0.0001)	-0.4318 (<0.0001)
Medical Treatment	-0.3211 (0.0034)	-0.3828 (0.0060)	-0.4004 (<0.0001)	-0.3019 (<0.0001)
Physician Quality	0.2431 (0.0040)	0.4051 (0.0001)	0.4253 (<0.0001)	0.3723 (<0.0001)
Surgical Care	0.1672 (0.1784)	0.3079 (0.0468)	0.4391 (<0.0001)	0.4775 (<0.0001)
Medicare*Price	-0.0114 (0.0321)	-0.0185 (0.0005)	-0.0001 (0.0013)	-0.0134 (0.0028)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.8536 (<0.0001)
Inclusive Value Integration = 1	N/A	N/A	N/A	1.0306 (<0.0001)
N	578	578	5320	5320
Adjusted R^2	0.0761	0.1451		
Log Likelihood			-6777.561	-6570.502

* p value based on the null hypothesis that the coefficient = 1

Table 6-7a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(1995 new employees choosing single coverage)
(p-values in parentheses)

	Conditional Logit
Price	-0.0278 (0.0858)
Docs/Members	-4.0938 (0.2349)
Integration	-0.0668 (0.7177)
Prevention	-0.1527 (0.5297)
Satisfaction	-0.5540 (0.0442)
Medical Treatment	0.4421 (0.0786)
Physician Quality	-0.1410 (0.5644)
Surgical Care	-0.3862 (0.1690)
Inclusive Value Integration = 0	N/A
Inclusive Value Integration = 1	N/A
N	294
Log Likelihood	-353.708

* p value based on the null hypothesis that the coefficient = 1

Table 6-8a
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(1995 plan switchers choosing single coverage)
(p-values in parentheses)

	Conditional Logit
Price	-0.0212 (<0.0001)
Docs/Members	-5.3541 (<0.0001)
Integration	-0.7586 (<0.0001)
Prevention	-0.2839 (0.0148)
Satisfaction	0.1307 (0.1922)
Medical Treatment	0.7902 (<0.0001)
Physician Quality	-0.3208 (0.0002)
Surgical Care	-0.1201 (0.3550)
Inclusive Value Integration = 0	N/A
Inclusive Value Integration = 1	N/A
N	1637
Log Likelihood	-2330.20

* p value based on the null hypothesis that the coefficient = 1

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Chapter VII
Discussion

7.1 Preferred Statistical Model

As chapter VI illustrates, there are significant differences in the estimated coefficients and standard errors within samples. The estimated standard errors for the logit models in particular are much smaller than for the two share regression models. As discussed in Chapter V, the differences are likely due to a violation of the assumption that the observations in the logistic regressions are independently and identically distributed, since plans are common to many individuals in the logit models. For this reason, the share regression models, which aggregate the data to form market shares, are preferred to the logit models.

The preferred share regression model will depend on the nature of the heteroskedasticity. As discussed in chapter V, there are two likely sources of error; unobserved plan attributes (γ_j's) and the stochastic error (v_{jm}/P_{jm}). The γ_j's are assumed homoskedastic, but the variance of v_{jm}/P_{jm} will depend on the size of the market. If the errors are dominated by the stochastic component (v_{jm}/P_{jm}), then the share regressions weighted by the market size are preferred. If the errors are primarily due to unobserved plan attributes, then the unweighted share regressions are preferred because weighting by market size will exacerbate, as opposed to ameliorate, the heteroskedasticty problem.

The hypothesis that heteroskedasticity was related to differences in market size was tested. Unweighted share regression models were estimated for each sample, and the squared residuals from these models were regressed on the inverse of the market size.[1] T-tests were conducted for the resulting parameter estimates to determine if the coefficient on market size was significantly different from zero. In both active non-union samples, and the active union sample, the hypothesis that market size was unrelated to the estimated residuals could not be rejected at the p=0.10 level.[2] In the two retiree samples,

[1] Estimates are not presented for the new hire and switcher samples because the samples were too small to estimate share regressions.

[2] For example, the p-value for the coefficient in the sample of active non-union workers choosing single coverage was 0.59.

the estimates were negative, and the hypothesis that market size was unrelated to the estimated residuals could be rejected at the p=0.01 level.

The results from the two samples of active non-union employees, and the sample of union employees, suggest that the primary source of error is unobserved plan attributes. The results from the other samples suggest that the error may be related to market size, although in a manner that is counterintuitive to the weight used in the share regression model. Therefore, the unweighted share regression model is preferred. Robust standard errors are preferred because the power of the heteroskedasticity test is low and theory predicts that the variance of the errors is heteroskedastic.

7.2 Summary of Findings across Samples

Table 7-1 presents the odds ratios and p-values from the unweighted share regression model for all samples.

Report Card Ratings

As table 7-1 illustrates, the results for the report card ratings are sometimes different from the hypothesized relationship and frequently vary across samples. Preventive care is the only rating that is related positively to plan enrollment for all samples. The preventive care estimates are statistically significant at p=0.10 for all samples except union workers choosing single coverage.[3] The odds ratios are larger for the two samples of active non-union employees relative to the retiree samples. For example, Medicare eligible and non-Medicare retirees were approximately 30 percent more likely to enroll in plans that received a superior rating on preventive care, while active employees choosing single and family coverage were, respectively, 74 and 90 percent more likely to enroll in superior plans. The stronger relationship between enrollment and the preventive care rating for active employees may indicate that the measures comprising the preventive care rating (such as cervical cancer screenings, mammograms, and cholesterol screenings) are more salient for younger employees relative to retirees.

[3] The results for the sample of union workers choosing single coverage should be interpreted cautiously since the model is overfitted (i.e. eight regressors on a sample of 56 shares).

The relationship between the satisfaction rating and plan enrollment is consistent across samples, but differs from the hypothesized relationship since the probability of enrollment is estimated to be related inversely to this rating. The estimates from all but two samples (active non-union employees choosing family coverage and non-Medicare retirees) are statistically significant at the p=0.10 level. The odds ratios suggest that employees and retirees are between 8 and 66 percent less likely to enroll in plans receiving a superior satisfaction rating.

The satisfaction results seem counterintuitive, but may be due to a correlation between unobserved plan attributes that are valued by consumers and the measures that comprise the satisfaction index. For example, two of the measures that comprise the satisfaction index are waiting times for urgent and non-urgent physician appointments. The firm assumed that longer waiting times are worse - a plausible assumption. However, if longer waiting times are positively correlated with measures that are not included in the model (such as the popularity of a health plan's physicians), then the parameter estimates will suggest that enrollees prefer longer waits, when in fact they actually prefer popular physicians. Examination of the relationship between plan enrollment and the actual disaggregated HEDIS data might provide valuable insight into the reason for this counterintuitive finding.

The results for the medical treatment, physician quality, and surgical care ratings are also mixed and vary by sample. For example, the probability of enrollment is related inversely to the physician quality and surgical care ratings for both samples of active non-union employees, but related positively for the retiree samples. The significance of the estimates varies however. For the physician quality rating, the estimates for the retiree models are significantly different from zero whereas the estimates for the active non-union samples are not. For the surgical care rating, only the estimate for the sample of active non-union employees choosing family coverage is significantly different from zero.

The physician quality and surgical care results raise the possibility that retirees are more likely to take the physician quality and surgical care ratings at face value, perhaps because these ratings are more salient for an older population, or because retirees are less informed. However, if this hypothesis is true, one would expect the results for the sample

of union employees choosing single coverage to be more similar to the results for the samples of active non-union employees. Instead, the estimates for union workers are more similar to the retiree samples, perhaps because union workers are more similar to retirees in their level of education (i.e. the majority of retirees may have been union members), or because the model is overfitted for this sample.

Retirees and active non-union employees also differ in the relationship between the probability of plan enrollment and the medical treatment rating. Enrollment for the two active non-union samples is related positively to the medical treatment rating while enrollment is related inversely for the retiree samples. Only the estimates from the retiree samples are significant however, and the corresponding odds ratios suggest that Medicare eligible retirees are 43 percent less likely to enroll in plans with a superior medical treatment rating, while non-Medicare retirees are 23 percent less likely to enroll in these plans.

This finding is difficult to interpret and is due likely to the presence of important unobserved plan attributes that are valued by retirees and correlated with measures that comprise the medical treatment rating. The fact that retiree enrollment is related inversely to the medical treatment rating suggests that the aforementioned positive relationship between enrollment and the physician quality and surgical care ratings may not be due to a greater propensity for retirees to respond to the ratings. Instead, the positive coefficient for the physician quality and surgical care ratings for the retiree samples may be due to spurious correlations with unobserved plan attributes, rather than direct response by retirees, since one might expect that retirees would respond similarly for all ratings.

Out-of-Pocket Price

Out-of-pocket price is related inversely to the probability of plan enrollment for all samples, with statistical significance achieved for all retiree models at the $p=0.10$ level. The estimate for active non-union employees choosing family coverage is statistically different from zero at the $p=0.11$ level, and the corresponding odds ratio suggests that this sample is five percent less likely to enroll in a plan that is $5 per month more expensive than an otherwise identical plan. When the outlier plans are excluded

from the analysis, the price estimates become more significant and are statistically significant for the sample of active non-union employees choosing single coverage.

The odds ratios for a five dollar increase in price range from 0.86 to 0.98. Compared to non-Medicare eligible retirees, Medicare retirees are more sensitive to price as evidenced by the negative coefficient when the out-of-pocket price variable is interacted with a Medicare dummy variable.

Model Type and Physician Choice

Like many of the plan ratings, the relationship between plan enrollment and the physicians/enrollees and integration variables differs for active non-union employees and retirees. For example, union employees and retirees prefer less integrated models and plans with fewer physicians/enrollees, relative to both samples of active non-union employees. Most of the estimates are not significantly different from zero however at the p=0.10 level.

The results for the integration and physicians/enrollees variables make it difficult to explain the preferences of active employees and retirees, and highlights the difficulty of categorizing health plans in today's marketplace. For example, the estimates for the integration variable for the retiree samples suggest that retirees prefer loosely integrated plans such as IPAs, perhaps because these plans traditionally contract with many physicians and offer more flexible choice of provider. However, the physicians/enrollees estimates suggest that retirees prefer plans with fewer, rather than more physicians/enrollees; a trait historically associated with tightly integrated plans such as group or staff model HMOs.

7.2 Significance of Findings

Employers

The results from this study suggest that employers may want to re-consider efforts to provide employees and retirees with health plan ratings for two reasons. First, even though the study is cross-sectional in nature, there does not appear to be strong evidence that employees and retirees used the information provided. Rather, it appears that MC

plan enrollment is largely driven by out-of-pocket price. Given the significant costs associated with collecting and analyzing HEDIS data and disseminating health plan performance ratings, firms may be better served by using these resources elsewhere, especially if the goal is to steer employees to particular MC plans.

Second, there are several serious concerns about the methodology used to construct health plan ratings, including issues of valuation, aggregation, and weighting. In several instances it appears as though the firm's methodology might be in direct conflict with the preferences of employees and retirees. These results suggest that if plan performance ratings are constructed in the future, more research should be conducted in order to develop valid plan ratings that are acceptable to consumers. To this end, employers should consult with other organizations that evaluate health plans, such as the National Committee for Quality Assurance (NCQA) or the Consumer Assessment of Health Plans (CAHPS) survey sponsored by the Agency for Health Care Policy & Research (AHCPR).

This study analyzed one of the very first attempts to provide employees and retirees with health plan ratings. Therefore, it is entirely possible that future improvements in methodology may lead to increased acceptability and use of health plan ratings. In this case, the crucial question for employers to consider is how much more would be gained (in terms of 'goodwill' and/or cost-savings) by providing comparative information to employees in addition to price incentives to enroll in specific managed care plans.

The initial purpose of HEDIS was to develop a data set that could be used by employers to assess the value received for managed care premiums, and to compare competing plans on a variety of standardized measures. HEDIS was viewed as a tool that could increase dialogue between corporations and plans when contracting for health benefits. It may be more beneficial for firms to abandon efforts to develop and provide plan ratings for employees and retirees in favor of using HEDIS internally for purposes of plan selection, competitive contracting, and out-of-pocket pricing.

Medicare

As discussed in chapter I, many policy analysts are interested in increasing enrollment in Medicare MC plans, and have suggested that that this goal can be achieved by converting Medicare to a defined contribution program and/or by providing beneficiaries with comparable information about MC options. The results from this study offer limited insight into these proposed policies.

First, the results from the Medicare eligible retiree sample indicate that Medicare retirees who enrolled in Medicare HMOs are more price sensitive than non-Medicare retirees, suggesting that price is an important predictor of MC plan choice for this population. It is reasonable to infer from these results that changing Medicare to a defined contribution plan, where beneficiaries pay the difference between the government contribution and the price of the plan they choose to enroll in, may encourage beneficiaries to enroll in low priced plans. However, the generalizability of the results from this study is limited, since the results apply to choice of MC plan conditional on having enrolled in a Medicare HMO. The true population of interest for Medicare policies aimed at increasing MC enrollment are those beneficiaries currently enrolled in Medicare FFS coverage. Although it is likely that Medicare FFS enrollees will also be price sensitive, it is impossible to ascertain from this study the magnitude of their price sensitivity relative to Medicare MC enrollees.

The relationship between Medicare MC enrollment and health plan ratings is mixed as it is for the non-Medicare population. However, relative to non-Medicare retirees and active employees, Medicare plan enrollment is correlated more strongly with the 'physician quality' rating. These results should be interpreted cautiously however since, as stated at the outset, it is impossible in the cross-section to determine whether or not this correlation is due to the report card information or to other important unobserved variables that are correlated with these measures. Moreover, because the results for the other plan ratings are mixed for both the Medicare and non-Medicare samples, it is important not to place too much emphasis on the 'physician quality' result. In fact the only statement that can be made with confidence is that there does not appear to be strong evidence to suggest that Medicare MC enrollees systematically used the plan ratings.

These results, combined with those from the non-Medicare samples, suggest that HCFA should be hesitant to embark on costly beneficiary information initiatives with the expectation that significant positive changes in Medicare MC enrollment will result from the release of health plan performance ratings. Instead, more research should be conducted before such a campaign is initiated to examine the impact of comparative MC information on the enrollment choices made by Medicare FFS enrollees.

Health Plans

As discussed in chapter I, health plans incur significant costs in order to collect and report HEDIS data. The results from this study question the value of these expenditures for two reasons. First, if the primary purpose of collecting HEDIS data is to provide comparable plan information, but consumers do not use the information, then health plans may be spending resources that might be used more appropriately.

Second, evidence from this study and others [Scanlon, et al. (1998)] suggest that HEDIS data may be used inappropriately in the construction of health plan ratings. Plan ratings that are based on invalid or poor methodology are potentially disastrous if they are used by consumers or publicized in the popular press. The results from this study suggest that health plans and their professional associations should take a more pro-active role in assuring that published health plan ratings are based on methodologically sound principles.

7.3 Limitations of the Study

There are several important limitations that must be considered when assessing the results from this study. First the research question (whether the health plan choices made by a cross-section of employees and retirees in 1995 were correlated with health plan report card ratings constructed and disseminated by the firm) is phrased rather cautiously because data on plan prices and enrollment prior to the data release were not available. Hence, the results, although suggestive of whether plan ratings were used by employees and retirees, cannot definitively determine whether or not plan enrollments were influenced by the ratings. Second, there are many important variables that simply could not be observed by the researcher. Distance to providers and whether or not one's

existing physician is a member of the various managed care plans that were available are examples of potentially important unobserved variables. Unobserved variables and missing data are complex issues that plague any researcher doing cross-sectional analysis.

Third, it is likely that the physicians/enrollees and integration variables suffer from measurement error, which would introduce bias into the estimated coefficients. The physicians/enrollees variable is hypothesized to capture the degree of physician availability in a health plan. However, because physicians often contract with many plans, and differ in whether they are accepting new patients, the ratio of the plan's physicians to plan enrollees is probably a noisy measure of physician availability. Likewise, the integration variable is designed to capture the degree of physician autonomy within a health plan. However, with the growth of capitated payment systems in all model types, it is likely that this variable is also measured with error.

Fourth, the firm constructed plan ratings were based on deviations of plan reported HEDIS measures from national and regional benchmarks. However, the data reported to the firm by the health plans was sometimes incomplete. The firm established specific rules for developing plan ratings when missing data existed, but only the plan ratings were available to the researcher. The presence of missing data may have affected the comparability of plan ratings and introduced bias into the estimated relationship between the plan ratings and the probability of plan enrollment.

Additional limitations include concerns about using individual data rather than grouped data. Although aggregating data to form market shares is theoretically appealing, it creates concerns about the comparability of market shares between very small and large markets. Furthermore, rules regarding market size cutoffs for inclusion in the analysis were relaxed for the retiree samples due to the presence of many small markets (in terms of numbers of retirees).

7.4 Future Research

Future work will attempt to build on the results and limitations of this study by focussing on two specific areas. First, the validity of the value judgments made by the firm in constructing report card ratings will be tested empirically by examining models of plan choice using disaggregated rather than aggregated HEDIS data. This analysis will

allow several hypotheses about the implausible signs obtained in this dissertation to be tested. For example, by deconstructing the 'enrollee satisfaction' rating and including each of its measures in models of plan choice, the hypothesis that consumers prefer plans with longer waiting times - because waiting time proxies for physician popularity - will be tested.

Second, future work will use longitudinal data, including data before health plan ratings are released, in an attempt to difference out important unobserved variables. This type of data, which includes information on out-of-pocket prices and enrollment for the same individuals before the release of the report card ratings, should lead to more conclusive results about the impact of plan performance measures.

7.5 Conclusion

As competition heightens in health insurance markets, superior plans will only be rewarded if consumers are able to identify these plans from their set of options. Health plan report cards can potentially provide a valuable service by informing consumers about plan traits. The analysis conducted in this dissertation suggests that consumers may not use plan report cards as hypothesized. Instead, the results from this study suggest that employees and retirees are responsive to out-of-pocket price, and that price incentives may be the best way to influence MC enrollments.

Table 7-1
Odds Ratios from Unweighted Share Regressions

	Active Non-Union Employees Choosing Single Coverage	Active Non-Union Employees Choosing Family Coverage	Active Union Employees Choosing Single Coverage	Medicare Eligible Retirees Choosing Single Coverage	Non-Medicare Eligible Retirees Choosing Single Coverage	Pooled Retiree Sample Choosing Single Coverage
Price (std. dev.)	0.8448	0.7559	0.6053	0.6604***	0.8187***	0.8325***
Price ($5)	0.9204	0.9532	0.8573	0.9278***	0.9792***	0.9796***
Docs/Members	1.1953*	1.0840	0.9502	0.9304	0.9372	0.9288*
Integration	1.1088	1.1067	0.3790***	0.7628	0.9161	0.8898
Prevention	1.7378***	1.8947***	1.2257	1.2959*	1.2968***	1.2939***
Satisfaction	0.4429***	0.6901	0.3380***	0.6142***	0.9286	0.8396**
Medical Treatment	1.0737	1.0932	0.9256	0.5670***	0.7686**	0.7253***
Physician Quality	0.9879	0.7763	2.9336***	1.4509**	1.2830***	1.2753***
Surgical Care	0.7548	0.5577*	2.4106	1.4011	1.1834	1.1820
Medicare*Price (std. dev.)	NA	NA	NA	NA	NA	0.6036**
N	113	154	56	109	469	578

*** statistically significant at the 0.01 level
** statistically significant at the 0.05 level
* statistically significant at the 0.01 level

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APPENDICES

APPENDIX A

DESCRIPTIVE STATISTICS AND CORRELATIONS

Table 4-3a
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(active non-union employees choosing single coverage)
(N=157)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	217.08	10.16	200.67	258.75
Docs/Members	0.030	0.036	0.001	0.20
Integration	0.31	0.46	0.00	1.00
Prevention	0.29	0.45	0.00	1.00
Satisfaction	0.16	0.37	0.00	1.00
Medical Treatment	0.34	0.48	0.00	1.00
Physician Quality	0.27	0.44	0.00	1.00
Surgical Care	0.27	0.45	0.00	1.00
Plans/Market	3.57	1.53	2.00	7.00
Enrollees/Market	131.71	158.36	20.00	685.00
Markets/Plan	1.78	1.11	1.00	5.00

Table 4-3b
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(active non-union employees choosing family coverage)
(N=212)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	597.34	29.19	551.83	711.58
Docs/Members	0.029	0.035	0.001	0.20
Integration	0.31	0.46	0.00	1.00
Prevention	0.29	0.46	0.00	1.00
Satisfaction	0.17	0.38	0.00	1.00
Medical Treatment	0.35	0.48	0.00	1.00
Physician Quality	0.29	0.46	0.00	1.00
Surgical Care	0.30	0.46	0.00	1.00
Plans/Market	3.66	1.49	2.00	7.00
Enrollees/Market	175.83	259.22	20.00	1218.00
Markets/Plan	2.23	1.77	1.00	8.00

Table 4-3c
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(active union employees choosing single coverage)
(N=85)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	9.68	16.30	0.00	69.83
Docs/Members	0.030	0.036	0.00	0.16
Integration	0.32	0.47	0.00	1.00
Prevention	0.24	0.43	0.00	1.00
Satisfaction	0.20	0.40	0.00	1.00
Medical Treatment	0.35	0.48	0.00	1.00
Physician Quality	0.27	0.45	0.00	1.00
Surgical Care	0.39	0.49	0.00	1.00
Plans/Market	2.93	1.00	2.00	5.00
Enrollees/Market	189.83	319.83	21.00	1621.00
Markets/Plan	1.67	1.78	1.00	5.00

Table 4-3d
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(Medicare eligible retirees)
(N=174*)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	17.66	27.67	-25.00	108.08
Docs/Members	0.027	0.025	0.001	0.135
Integration	0.33	0.47	0.00	1.00
Prevention	0.46	0.50	0.00	1.00
Satisfaction	0.33	0.47	0.00	1.00
Medical Treatment	0.53	0.50	0.00	1.00
Physician Quality	0.21	0.41	0.00	1.00
Surgical Care	0.49	0.50	0.00	1.00
Plans/Market	2.68	1.08	2.00	8.00
Enrollees/Market	11.71	15.72	2.00	82.00
Markets/Plan	4.243	4.683	1.00	20.00

* sample includes plans from all markets with two or more plan choices

Table 4-3e
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(non-Medicare eligible retirees)
(N=740*)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	18.13	47.58	-25.00	335.00
Docs/Members	0.029	0.033	0.001	0.201
Integration	0.33	0.47	0.00	1.00
Prevention	0.39	0.49	0.00	1.00
Satisfaction	0.20	0.40	0.00	1.00
Medical Treatment	0.43	0.50	0.00	1.00
Physician Quality	0.25	0.44	0.00	1.00
Surgical Care	0.37	0.48	0.00	1.00
Plans/Market	2.73	1.12	2.00	8.00
Enrollees/Market	16.82	47.31	2.00	645.00
Markets/Plan	6.85	7.74	1.00	36.00

* sample includes plans from all markets with two or more plan choices

Table 4-3f
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(pooled retiree sample)
(N=914*)

	Mean	Standard Deviation	Minimum	Maximum
Price (dollars per month)	18.05	44.47	-25.00	335.00
Docs/Members	0.028	0.033	0.001	0.361
Integration	0.33	0.47	0.00	1.00
Prevention	0.40	0.49	0.00	1.00
Satisfaction	0.22	0.42	0.00	1.00
Medical Treatment	0.45	0.50	0.00	1.00
Physician Quality	0.25	0.43	0.00	1.00
Surgical Care	0.39	0.49	0.00	1.00
Plans/Market	2.72	1.11	2.00	8.00
Enrollees/Market	15.83	43.08	2.00	645.00
Markets/Plan	8.39	10.28	1.00	51.00

* sample includes plans from all markets with two or more plan choices

Table 4-3g
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(1995 new employees)
(N=294)

	Mean	Standard Deviation	Minimum	Maximum
Price* (dollars per month)	214.21	5.66	205.96	258.75
Docs/Members*	0.023	0.017	0.005	0.087
Integration*	0.33	0.24	0.00	1.00
Prevention*	0.18	0.25	0.00	0.83
Satisfaction*	0.10	0.17	0.00	1.00
Medical Treatment*	0.27	0.29	0.00	1.00
Physican Quality*	0.22	0.27	0.00	1.00
Surgical Care*	0.27	0.32	0.00	1.00
Plans/Chooser	3.77	1.60	2.00	6.00
Choosers/Plan**	14.21	15.17	1.00	56.00

* Obtained by averaging the mean characteristics of each individual's choice set

** Obtained by averaging the mean number of people with the plan in one's choice set (78 total plans)

Table 4-3h
Descriptive Statistics for Price and Non-Price Health Plan Attributes
(1994-1995 Plan Switchers)
(N=1637)

	Mean	Standard Deviation	Minimum	Maximum
Price* (dollars per month)	215.62	7.62	205.96	258.75
Docs/Members*	0.031	0.021	0.005	0.087
Integration*	0.25	0.19	0.00	1.00
Prevention*	0.21	0.26	0.00	0.83
Satisfaction*	0.13	0.16	0.00	1.00
Medical Treatment*	0.30	0.34	0.00	1.00
Physican Quality*	0.23	0.21	0.00	1.00
Surgical Care*	0.31	0.35	0.00	1.00
Plans/Chooser	4.64	1.51	2.00	7.00
Choosers/Plan**	86.32	117.93	4.00	414.00

* Obtained by averaging the mean characteristics of each individual's choice set
** Obtained by averaging the mean number of people with the plan in one's choice set (88 total plans)

Table 4-4a
Correlation Coefficients for Price and Non-Price Attributes
(active non-union employees choosing single coverage)
(N=157)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	0.30	1.00						
Integration	-0.27	-0.34	1.00					
Preventive Care	**-0.10**	-0.25	**0.12**	1.00				
Satisfaction	**-0.01**	**-0.10**	**0.12**	0.19	1.00			
Medical Treatment	-0.29	-0.25	**0.09**	0.67	0.23	1.00		
Physician Quality	**<0.01**	**-0.03**	**-0.03**	0.22	**-0.03**	0.41	1.00	
Surgical Care	-0.27	-0.16	0.17	0.46	0.24	0.55	0.24	1.00

bold indicates not significant at p=0.10

Table 4-4b
Correlation Coefficients for Price and Non-Price Attributes
(active non-union employees choosing family coverage)
(N=212)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	0.31	1.00						
Integration	-0.28	**-0.34**	1.00					
Preventive Care	-0.14	-0.24	0.13	1.00				
Satisfaction	**0.02**	0.12	0.18	0.18	1.00			
Medical Treatment	-0.31	-0.27	**0.11**	0.66	0.17	1.00		
Physician Quality	**0.03**	**-0.03**	**-0.01**	0.16	**-0.04**	0.40	1.00	
Surgical Care	-0.30	-0.14	0.20	0.48	0.28	0.57	0.21	1.00

bold indicates not significant at p=0.10

Table 4-4c
Correlation Coefficients for Price and Non-Price Attributes
(active union employees choosing single coverage)
(N=85)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	**-0.01**	1.00						
Integration	0.30	-0.42	1.00					
Preventive Care	**-0.02**	-0.20	**0.10**	1.00				
Satisfaction	0.18	-0.18	0.29	**-0.14**	1.00			
Medical Treatment	**-0.12**	-0.28	0.24	0.63	0.31	1.00		
Physician Quality	0.23	**0.04**	0.44	**0.04**	0.23	0.27	1.00	
Surgical Care	**0.08**	**0.004**	0.18	0.58	0.33	0.78	0.33	1.00

bold indicates not significant at p=0.10

Table 4-4d
Correlation Coefficients for Price and Non-Price Attributes
(Medicare eligible retirees)
(N=174*)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	**-0.05**	1.00						
Integration	**0.02**	-0.56	1.00					
Preventive Care	**0.09**	-0.23	**-0.04**	1.00				
Satisfaction	**0.11**	-0.31	0.35	0.40	1.00			
Medical Treatment	**-0.03**	-0.50	0.33	0.57	0.30	1.00		
Physician Quality	**-0.06**	-0.26	0.32	-0.17	-0.01	0.38	1.00	
Surgical Care	-0.17	-0.49	0.43	0.53	0.38	0.62	0.19	1.00

bold indicates not significant at p=0.10

* sample includes plans from all markets with two or more plan choices

Table 4-4e
Correlation Coefficients for Price and Non-Price Attributes
(non-Medicare eligible retirees)
(N=740)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	**-0.004**	1.00						
Integration	**-0.002**	-0.36	1.00					
Preventive Care	**0.01**	-0.24	**-0.01**	1.00				
Satisfaction	**-0.03**	-0.15	0.27	0.24	1.00			
Medical Treatment	**-0.03**	-0.30	0.07	0.72	0.26	1.00		
Physician Quality	**0.02**	**0.00**	**0.06**	0.10	-0.06	0.30	1.00	
Surgical Care	**-0.03**	-0.12	0.20	0.54	0.30	0.62	0.11	1.00

bold indicates not significant at p=0.10

Table 4-4f
Correlation Coefficients for Price and Non-Price Attributes
(pooled retiree sample)
(N=914*)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	**-0.01**	1.00						
Integration	**0.001**	-0.37	1.00					
Preventive Care	**0.02**	-0.24	-0.01	1.00				
Satisfaction	**-0.01**	-0.17	0.28	0.28	1.00			
Medical Treatment	**-0.03**	-0.32	0.12	0.70	0.28	1.00		
Physician Quality	**0.01**	**-0.04**	0.11	**0.05**	-0.06	0.31	1.00	
Surgical Care	**-0.04**	-0.18	0.24	0.54	0.33	0.63	0.12	1.00

bold indicates not significant at p=0.10

* sample includes plans from all markets with two or more plan choices

Table 4-4g
Correlation Coefficients for Price and Non-Price Attributes
(1995 new employees)
(N=294)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	0.28	1.00						
Integration	**-0.07**	-0.41	1.00					
Preventive Care	-0.15	0.10	0.40	1.00				
Satisfaction	**-0.09**	0.17	**-0.03**	0.55	1.00			
Medical Treatment	-0.16	0.15	-0.14	0.65	0.60	1.00		
Physician Quality	0.41	0.33	-0.15	0.23	0.31	0.44	1.00	
Surgical Care	-0.30	0.19	**-0.06**	0.55	0.31	0.75	0.22	1.00

bold indicates not significant at p=0.10

Table 4-4h
Correlation Coefficients for Price and Non-Price Attributes
(1994-1995 plan switchers)
(N=1637)

Variable Name	Price	Doctors/ Members	Integration	Preventive Care	Satisfaction	Medical Treatment	Physician Quality	Surgical Care
Price	1.00							
Doctors/Members	0.52	1.00						
Integration	-0.19	-0.51	1.00					
Preventive Care	0.73	**0.01**	0.41	1.00				
Satisfaction	-0.24	**0.01**	0.36	0.63	1.00			
Medical Treatment	-0.40	-0.08	0.34	-0.08	0.63	1.00		
Physician Quality	0.33	0.36	-0.08	0.29	0.30	0.39	1.00	
Surgical Care	-0.43	**0.03**	0.27	0.73	0.43	0.86	0.36	1.00

bold indicates not significant at p=0.10

APPENDIX B

RESULTS

Table 6-1b
Odds Ratios
(active non-union employees choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.844799	0.805407	0.882920	0.890388
Price ($5)	0.920351	0.898975	0.940560	0.944467
Docs/Members	1.195338	1.148966	1.114052	1.033344
Integration	1.108814	1.220991	0.972173	0.915966
Prevention	1.737774	2.077219	0.987755	1.022618
Satisfaction	0.442926	0.323008	0.682925	0.662179
Medical Treatment	1.073750	1.095266	1.536182	1.464743
Physician Quality	0.987922	0.839869	1.153072	1.075334
Surgical Care	0.754766	0.760790	1.113380	1.076973

Table 6-1c
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes (active non-union employees choosing single coverage – outliers excluded) (p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression
Price (std. dev.)	-0.026401 (0.0324)	-0.026551 (0.0633)
Docs/Members	7.214533 (0.0002)	6.393679 (0.0363)
Integration	0.256035 (0.1901)	0.367658 (0.0766)
Prevention	0.615815 (<0.00001)	0.731698 (0.0001)
Satisfaction	-0.893967 (0.0001)	-1.155069 (0.0001)
Medical Treatment	0.118809 (0.6597)	0.075956 (0.7914)
Physician Quality	0.066779 (0.7250)	-0.062644 (0.7405)
Surgical Care	-0.075518 (0.8090)	-0.045279 (0.8847)
N	106	106
Adjusted R^2	0.3504	0.4947

* p value based on the null hypothesis that the coefficient = 1

Table 6-1d
Odds Ratios
(active non-union employees choosing single coverage – outliers excluded)

	Unweighted Share Regression	Weighted Share Regression
Price (std. dev.)	0.764729	0.763564
Price ($5)	0.876337	0.875680
Docs/Members	1.296571	1.258817
Integration	1.291798	1.444348
Prevention	1.851165	2.078607
Satisfaction	0.409030	0.315036
Medical Treatment	1.126155	1.078915
Physician Quality	1.069059	0.939278
Surgical Care	0.927263	0.955731

Table 6-2b
Odds Ratios
(active non-union employees choosing family coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.755857	0.706633	0.833852	0.907947
Price ($5)	0.953186	0.942254	0.969356	0.983595
Docs/Members	1.083975	1.109757	1.142774	1.198502
Integration	1.106708	1.087324	0.983333	1.175531
Prevention	1.894705	2.239351	1.102944	1.259595
Satisfaction	0.690149	0.415732	0.901360	0.995563
Medical Treatment	1.093192	1.183708	1.283101	1.417805
Physician Quality	0.776276	0.572733	0.832160	0.871517
Surgical Care	0.557694	0.622006	1.144262	0.962830

Table 6-2c
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(active non-union employees choosing family coverage – outliers excluded)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression
Price	-0.004788 (0.2676)	-0.007444 (0.0848)
Docs/Members	2.374390 (0.3969)	1.685897 (0.5245)
Integration	0.262167 (0.1354)	0.417610 (0.0258)
Prevention	0.639958 (<0.00001)	0.831099 (0.0001)
Satisfaction	-0.227742 (0.3430)	-0.617877 (0.0012)
Medical Treatment	0.276371 (0.2948)	0.172029 (0.5201)
Physician Quality	-0.170079 (0.4266)	-0.390869 (0.0232)
Surgical Care	-0.566243 (0.0723)	-0.483532 (0.0866)
N	147	145
Adjusted R^2	0.1714	0.4141

* p value based on the null hypothesis that the coefficient = 1

Table 6-2d
Odds Ratios
(active non-union employees choosing family coverage – outliers excluded)

	Unweighted Share Regression	Weighted Share Regression
Price (std. dev.)	0.869565	0.804696
Price ($5)	0.976344	0.963464
Docs/Members	1.086654	1.060782
Integration	1.299744	1.518328
Prevention	1.896401	2.295840
Satisfaction	0.796330	0.539088
Medical Treatment	1.318337	1.187712
Physician Quality	0.843598	0.676469
Surgical Care	0.567654	0.616602

Table 6-3b
Odds Ratios
(active union employees choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.605295	0.486528	0.698073	0.674736
Price ($5)	0.857272	0.801717	0.895606	0.886313
Docs/Members	0.950245	0.939391	0.854181	0.845797
Integration	0.378983	0.306638	0.416008	0.443060
Prevention	1.225667	1.480191	1.075606	0.976451
Satisfaction	0.337962	0.343566	0.487478	0.518658
Medical Treatment	0.925590	0.717541	0.473038	0.476151
Physician Quality	2.933617	3.812519	2.561415	2.569111
Surgical Care	2.410649	3.340776	3.434255	3.066080

Table 6-3c
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(active union employees choosing single coverage – outliers excluded)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression
Price	-0.059108 (0.0067)	-0.067050 (0.0014)
Docs/Members	-15.157347 (0.0099)	-14.366941 (0.0143)
Integration	-1.358743 (<0.00001)	-1.447744 (0.0001)
Prevention	0.500603 (0.0308)	0.718140 (0.0073)
Satisfaction	-1.595382 (<0.00001)	-1.525290 (0.0001)
Medical Treatment	-0.655233 (0.1126)	-0.639600 (0.2169)
Physician Quality	1.661332 (<0.00001)	1.744308 (0.0001)
Surgical Care	1.723011 (0.0001)	1.732317 (0.0050)
N	52	52
Adjusted R^2	0.570600	0.6133

* p value based on the null hypothesis that the coefficient = 1

Table 6-3d
Odds Ratios
(active union employees choosing single coverage – outliers excluded)

	Unweighted Share Regression	Weighted Share Regression
Price (std. dev.)	0.381570	0.335238
Price ($5)	0.744130	0.715159
Docs/Members	0.579457	0.596182
Integration	0.256984	0.235100
Prevention	1.649716	2.050616
Satisfaction	0.202831	0.217558
Medical Treatment	0.519321	0.527503
Physician Quality	5.266321	5.721941
Surgical Care	5.601369	5.653738

Table 6-4b
Odds Ratios
(Medicare eligible retirees choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.660435	0.535197	0.604087	0.652497
Price ($5)	0.927776	0.893186	0.912945	0.925751
Docs/Members	0.930350	0.922060	0.928927	0.944294
Integration	0.762769	0.724599	0.612283	0.454154
Prevention	1.295942	1.430670	0.581788	0.537595
Satisfaction	0.614199	0.472589	0.547770	0.473213
Medical Treatment	0.566980	0.466889	0.716419	0.827273
Physician Quality	1.450906	1.801391	1.513886	1.468674
Surgical Care	1.401084	1.521592	2.082773	2.718826

Table 6-5b
Odds Ratios
(Non-Medicare retirees choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.818709	0.806530	0.630552	0.763258
Price ($5)	0.979199	0.977658	0.952694	0.972009
Docs/Members	0.937220	1.013226	0.982833	0.938519
Integration	0.916075	0.908340	0.720767	0.656646
Prevention	1.296804	1.519572	1.526931	1.600442
Satisfaction	0.928631	0.653498	0.830780	0.753776
Medical Treatment	0.768570	0.740447	0.645003	0.688968
Physician Quality	1.282995	1.473725	1.548830	1.479849
Surgical Care	1.183397	1.407532	1.502755	1.548939

Table 6-6b
Odds Ratios
(Pooled retiree sample choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.832514	0.816673	0.663795	0.784413
Price ($5)	0.979601	0.977487	0.954971	0.973068
Docs/Members	0.928752	0.976257	0.942065	0.921204
Integration	0.889755	0.879560	0.718873	0.666383
Prevention	1.293910	1.501151	1.241078	1.331146
Satisfaction	0.839626	0.608718	0.713060	0.649339
Medical Treatment	0.725325	0.681927	0.670032	0.739449
Physician Quality	1.275251	1.499455	1.530003	1.451068
Surgical Care	1.182001	1.360539	1.551372	1.612088
Medicare*Price (std. dev.)	0.603585	0.439618	0.993723	0.551116

Table 6-6c
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Pooled retiree sample choosing single coverage)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price	-0.004204	-0.004519	-0.009693	-0.005558
	(0.0036)	(0.0739)	(0.00001)	(0.00886)
Docs/Members	-1.964761	0.398173	-0.524730	-1.954800
	(0.1778)	(0.8113)	(0.4833)	(0.0039)
Integration	-0.087657	-0.096137	-0.327440	-0.420850
	(0.3237)	(0.3473)	(<0.00001)	(<0.00001)
Prevention	0.259903	0.418429	0.423260	0.469040
	(<0.00001)	(0.0001)	(<0.00001)	(<0.00001)
Satisfaction	-0.074044	-0.425416	-0.185390	-0.281200
	(0.4648)	(0.0002)	(0.0017)	(<0.00001)
Medical Treatment	-0.263224	-0.300501	-0.438500	-0.371910
	(0.0405)	(0.0513)	(<0.00001)	(<0.00001)
Physician Quality	0.249197	0.387793	0.437500	0.390540
	(0.0081)	(0.0002)	(<0.00001)	(<0.00001)
Surgical Care	0.168389	0.341838	0.407300	0.434880
	(0.2272)	0.045500	(<0.00001)	(<0.00001)
Medicare*Price	-0.010789	-0.018074	-0.000085	-0.009192
	(0.0521)	(0.00300)	(0.06804)	(0.0542)
Medicare*Docs/Members	-0.923014	-3.643976	-2.424400	0.434880
	(0.7054)	(0.25110)	(0.12228)	-(0.1270)
Medicare*Integration	-0.183143	-0.226000	-0.163130	-0.298160
	(0.3380)	(0.44810)	(0.54494)	(0.1407)
Medicare*Prevention	-0.000665	-0.060286	-0.964920	-1.106800
	(0.99680)	(0.78650)	(0.00005)	(<0.00001)
Medicare*Satisfaction	-0.413392	-0.324114	-0.416510	-0.502440
	(0.03640)	(0.22350)	(0.00356)	(0.0002)
Medicare*Medical Treatment	-0.304207	-0.461162	0.105010	0.434880
	(0.20490)	(0.21880)	(0.60693)	(0.1866)

Table 6-6c
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Pooled retiree sample choosing single coverage)
(p-values in parentheses)

continued

Medicare*Physician Quality	0.122991 (0.55470)	0.200766 (0.45720)	-0.022812 (0.88844)	-0.127390 (0.3548)
Medicare*Surgical Care	0.168858 (0.58340)	0.077919 (0.85790)	0.326400 (0.34086)	0.434880 (<0.00001)
Inclusive Value Integration = 0	N/A	N/A	N/A	1.05660 (<0.00001)
Inclusive Value Integration = 1	N/A	N/A	N/A	1.84580 (<0.00001)
N	578	578	5320	5320
Adjusted R^2	0.0768	0.1444		
Log Likelihood			-6748.983	-6541.481

* p value based on the null hypothesis that the coefficient = 1

Table 6-6d
Odds Ratios
(Pooled retiree sample choosing single coverage)

	Unweighted Share Regression	Weighted Share Regression	Conditional Logit	Nested Logit
Price (std. dev.)	0.829484	0.817945	0.952693	0.781009
Price ($5)	0.979199	0.977658	0.952693	0.972592
Docs/Members	0.937220	1.013226	0.982833	0.937528
Integration	0.916075	0.908340	0.720767	0.656489
Prevention	1.296804	1.519572	1.526931	1.598459
Satisfaction	0.928631	0.653498	0.830780	0.754877
Medical Treatment	0.768570	0.740447	0.645003	0.689416
Physician Quality	1.282995	1.473725	1.548830	1.477779
Surgical Care	1.183397	1.407532	1.502755	1.544778
Medicare*Price (std. dev.)	0.618915	0.447647	0.996216	0.664474
Medicare*Docs/Members	0.970000	0.886698	0.923112	1.014455
Medicare*Integration	0.832649	0.797718	0.849481	0.742183
Medicare*Prevention	0.999335	0.941495	0.381014	0.330615
Medicare*Satisfaction	0.661403	0.723168	0.659344	0.605053
Medicare*Medical Treatment	0.737708	0.630551	1.110722	1.544778
Medicare*Physician Quality	1.130874	1.222339	0.977446	0.880390
Medicare*Surgical Care	1.183952	1.081035	1.385970	1.544778

Table 6-6e
Estimates of the Relationship Between Choice of Health Plan and Plan Attributes
(Pooled retiree sample choosing single coverage – outliers excluded)
(p-values in parentheses)

	Unweighted Share Regression	Weighted Share Regression
Price	-0.004811	-0.004841
	(0.0073)	(0.0463)
Docs/Members	-1.507120	-1.802667
	(0.2091)	(0.1954)
Integration	-0.238288	-0.162292
	(0.0158)	(0.0866)
Prevention	0.241459	0.364275
	(0.0014)	(0.0001)
Satisfaction	-0.173681	-0.452326
	(0.1186)	(0.0001)
Medical Treatment	-0.526038	-0.429955
	(0.0001)	(0.0019)
Physician Quality	0.293151	0.423349
	(0.0029)	(0.0001)
Surgical Care	0.274210	0.348541
	(0.0878)	(0.026200)
Medicare*Price	-0.012762	-0.016606
	(0.0335)	(0.001900)
N	560	564
Adjusted R^2	0.1141	0.1312

* p value based on the null hypothesis that the coefficient = 1

Table 6-6f
Odds Ratios
(Pooled retiree sample choosing single coverage – outliers excluded)

	Unweighted Share Regression	Weighted Share Regression
Price (std. dev.)	0.807393	0.806316
Price ($5)	0.976232	0.976086
Docs/Members	0.951482	0.942247
Integration	0.787976	0.850193
Prevention	1.273105	1.439470
Satisfaction	0.840565	0.636147
Medical Treatment	0.590942	0.650538
Physician Quality	1.340645	1.527067
Surgical Care	1.315491	1.416999

Table 6-7b
Odds Ratio
(1995 new employees choosing single coverage)

	Conditional Logit
Price (std. dev.)	0.854247
Price ($5)	0.870084
Docs/Members	0.910139
Integration	0.935429
Prevention	0.858396
Satisfaction	0.574629
Medical Treatment	1.555925
Physician Quality	0.868472
Surgical Care	0.679648

Table 6-8b
Odds Ratios
(1995 plan switchers choosing single coverage)

	Conditional Logit
Price (std. dev.)	0.850920
Price ($5)	0.899488
Docs/Members	0.895091
Integration	0.468317
Prevention	0.752880
Satisfaction	1.139569
Medical Treatment	2.203903
Physician Quality	0.725583
Surgical Care	0.886876

Table 6-9a
Summary of Results for Price
(all samples and all models)

One Standard Deviation above Mean Price

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	0.845	0.2934	0.805	0.1909	0.883	< 0.0001	0.890	< 0.0001
Family Non-Union	0.756	0.1072	0.707	0.0158	0.834	< 0.0001	0.908	< 0.0001
Single Union	0.605	0.3109	0.487	0.1113	0.698	< 0.0001	0.675	< 0.0001
Medicare	0.660	0.0052	0.535	0.0001	0.604	< 0.0001	0.652	0.0003
Non-Medicare	0.819	0.0036	0.807	0.0826	0.631	< 0.0001	0.763	0.0081
Pooled Retirees	0.833	0.0045	0.817	0.0707	0.664	< 0.0001	0.784	0.0089
New Hires	NA	NA	NA	NA	0.854	0.0858	NA	NA
Switchers	NA	NA	NA	NA	0.851	0.0001	NA	NA

$5.00 above Mean Price

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	0.920	0.2934	0.899	0.1909	0.941	0.00002	0.944	< 0.0001
Family Non-Union	0.953	0.1072	0.942	0.0158	0.969	< 0.0001	0.984	< 0.0001
Single Union	0.857	0.3109	0.802	0.1113	0.896	< 0.0001	0.886	< 0.0001
Medicare	0.928	0.0052	0.893	0.0001	0.913	< 0.0001	0.926	0.0003
Non-Medicare	0.979	0.0036	0.978	0.0826	0.953	< 0.0001	0.972	0.0081
Pooled Retirees	0.980	0.0045	0.977	0.0707	0.955	< 0.0001	0.973	0.0089
New Hires	NA	NA	NA	NA	0.870	0.0858	NA	NA
Switchers	NA	NA	NA	NA	0.899	0.0001	NA	NA

Table 6-9b
Summary of Results for Physicians/Enrollees
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	1.195	0.0686	1.149	0.2685	1.114	< 0.0001	1.033	0.1443
Family Non-Union	1.084	0.4426	1.110	0.3484	1.143	< 0.0001	1.199	< 0.0001
Single Union	0.950	0.8806	0.939	0.8098	0.854	< 0.0001	0.846	< 0.0001
Medicare	0.930	0.1403	0.922	0.1623	0.929	0.0325	0.944	0.1054
Non-Medicare	0.937	0.1778	1.013	0.8166	0.983	0.4833	0.939	0.0051
Pooled Retirees	0.929	0.0605	0.976	0.6044	0.942	0.0048	0.921	< 0.0001
New Hires	NA	NA	NA	NA	0.910	0.2349	NA	NA
Switchers	NA	NA	NA	NA	0.895	< 0.0001	NA	NA

Table 6-9c
Summary of Results for Integration
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	1.109	0.6353	1.221	0.4125	0.972	0.4933	0.916	0.0182
Family Non-Union	1.107	0.6515	1.087	0.6972	0.983	0.5682	1.176	< 0.0001
Single Union	0.379	0.0057	0.307	0.0055	0.416	< 0.0001	0.443	< 0.0001
Medicare	0.763	0.1096	0.725	0.1805	0.612	0.0636	0.454	0.0003
Non-Medicare	0.916	0.3237	0.908	0.3612	0.721	< 0.0001	0.657	< 0.0001
Pooled Retirees	0.890	0.1386	0.880	0.1788	0.719	< 0.0001	0.666	< 0.0001
New Hires	NA	NA	NA	NA	0.935	0.7177	NA	NA
Switchers	NA	NA	NA	NA	0.468	< 0.0001	NA	NA

Table 6-9d
Summary of Results for Preventive Care
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	1.738	0.0002	2.077	0.0001	0.988	0.8239	1.023	0.6830
Family Non-Union	1.895	< 0.0001	2.239	0.0001	1.103	0.0242	1.260	< 0.0001
Single Union	1.226	0.6222	1.480	0.2749	1.076	0.9327	0.976	0.7682
Medicare	1.296	0.0860	1.431	0.0487	0.582	0.0173	0.538	0.0059
Non-Medicare	1.297	< 0.0001	1.520	0.0001	1.527	< 0.0001	1.600	< 0.0001
Pooled Retirees	1.294	< 0.0001	1.501	0.0001	1.241	0.0002	1.331	< 0.0001
New Hires	NA	NA	NA	NA	0.858	0.5297	NA	NA
Switchers	NA	NA	NA	NA	0.753	0.0148	NA	NA

Table 6-9e
Summary of Results for Satisfaction
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	0.443	0.0031	0.323	0.0001	0.683	< 0.0001	0.662	< 0.0001
Family Non-Union	0.690	0.1563	0.416	0.0001	0.901	0.0062	0.996	0.9081
Single Union	0.338	0.0012	0.344	0.0165	0.487	< 0.0001	0.519	< 0.0001
Medicare	0.614	0.0041	0.473	0.0004	0.548	< 0.0001	0.473	< 0.0001
Non-Medicare	0.929	0.4648	0.653	0.0003	0.831	0.0017	0.754	0.0001
Pooled Retirees	0.840	0.0488	0.609	0.0001	0.713	< 0.0001	0.649	< 0.0001
New Hires	NA	NA	NA	NA	0.575	0.0442	NA	NA
Switchers	NA	NA	NA	NA	1.140	0.1922	NA	NA

Table 6-9f
Summary of Results for Medical Treatment
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	1.074	0.8222	1.095	0.7912	1.536	< 0.0001	1.465	< 0.0001
Family Non-Union	1.093	0.7580	1.184	0.6043	1.283	< 0.0001	1.418	< 0.0001
Single Union	0.926	0.9023	0.718	0.6565	0.473	< 0.0001	0.476	< 0.0001
Medicare	0.567	0.0051	0.467	0.0104	0.716	0.0795	0.827	0.2778
Non-Medicare	0.769	0.0405	0.740	0.0584	0.645	< 0.0001	0.689	< 0.0001
Pooled Retirees	0.725	0.0034	0.682	0.0060	0.670	< 0.0001	0.739	< 0.0001
New Hires	NA	NA	NA	NA	1.556	0.0786	NA	NA
Switchers	NA	NA	NA	NA	2.204	< 0.0001	NA	NA

Table 6-9g
Summary of Results for Physician Quality
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	0.988	0.9580	0.840	0.4347	1.153	0.0014	1.075	0.0844
Family Non-Union	0.776	0.2735	0.573	0.0062	0.832	< 0.0001	0.872	0.0002
Single Union	2.934	0.0107	3.813	0.0057	2.561	< 0.0001	2.569	< 0.0001
Medicare	1.451	0.0450	1.801	0.0067	1.514	0.0071	1.469	0.0051
Non-Medicare	1.283	0.0081	1.474	0.0003	1.549	< 0.0001	1.480	< 0.0001
Pooled Retirees	1.275	0.0040	1.499	0.0001	1.530	< 0.0001	1.451	< 0.0001
New Hires	NA	NA	NA	NA	0.868	0.5644	NA	NA
Switchers	NA	NA	NA	NA	0.726	0.0002	NA	NA

Table 6-9h
Summary of Results for Surgical Care
(all samples and all models)

	Unweighted Share		Weighted Share		Conditional Logit		Nested Logit	
	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value	Odds Ratio	P Value
Single Non-Union	0.755	0.4546	0.761	0.4585	1.113	0.0769	1.077	0.2077
Family Non-Union	0.558	0.0888	0.622	0.1607	1.144	0.0063	0.963	0.3755
Single Union	2.411	0.1940	3.341	0.1697	3.434	< 0.0001	3.066	< 0.0001
Medicare	1.401	0.2193	1.522	0.2222	2.083	< 0.0001	2.719	0.0015
Non-Medicare	1.183	0.2272	1.408	0.0521	1.503	< 0.0001	1.549	< 0.0001
Pooled Retirees	1.182	0.1784	1.361	0.0468	1.551	< 0.0001	1.612	< 0.0001
New Hires	NA	NA	NA	NA	0.680	0.1690	NA	NA
Switchers	NA	NA	NA	NA	0.887	0.3550	NA	NA